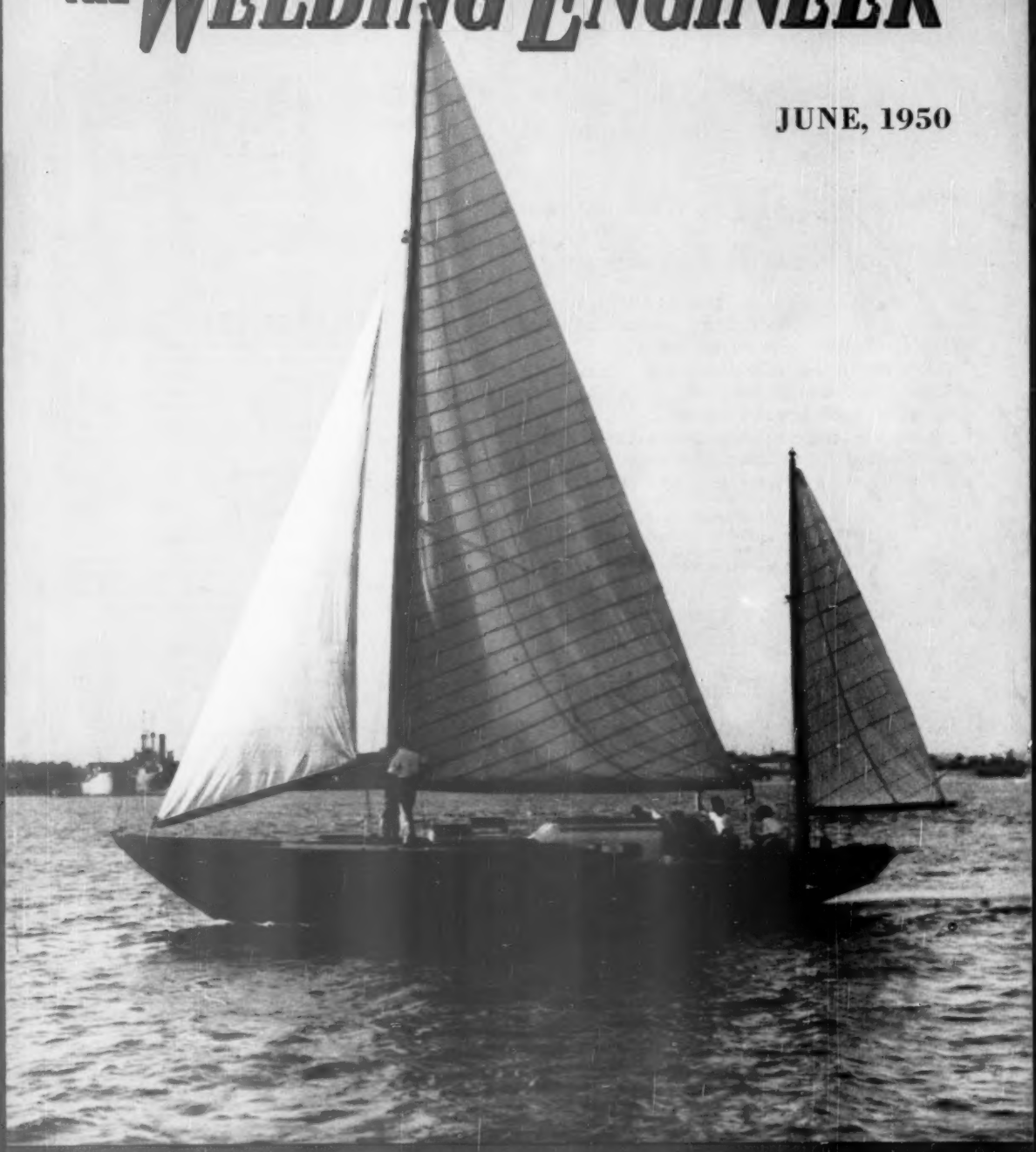
THE WELDING ENGINEER

JUNE, 1950



IN THIS ISSUE: "We Built a Boat"... page 1

A McGRAW-HILL PUBLICATION

JACKSON
GROUND CLAMP
No. 2/0

GROUNDWORK

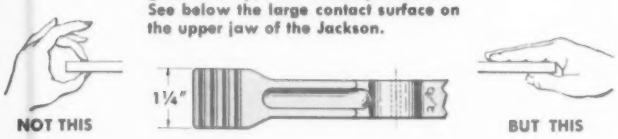
for Profitable Welding

Arc Welders must put on the heat. But only at one point: at the end of the electrode. And any heat elsewhere along the welding circuit means current wasted.

Don't rely on makeshift ground connections, inefficient and unwieldy C-clamps and plates, and on hastily made cable splices, ineffective and unstable.

Wherever connections must be made in the circuit, choose Jackson cable fittings which provide ample metal-to-metal contact to ease the flow, and stop the loss of current.

For greater metal-to-metal contact in a ground clamp, which would you choose? See below the large contact surface on the upper jaw of the Jackson.



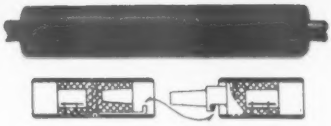
JACKSON GROUND CLAMPS

When choosing between ground clamps, take a close look at the Jackson, and note the large, flat contact surface of the copper alloy upper tong. It provides the greatest and surest conductivity between the clamp and the work.

Other features: Simple, rugged design: the upper tong for contact, the lower for pinch. Greater leverage at the "handle" end of the tongs; they go easier *on*, easier *off*.

Recent improvements: New music wire coil spring . . . complete spring insulation at both ends against accidental arcing, and to prolong spring life . . . new, larger pivot bolt for greater strength, where it counts most.

Double Economy: The Jackson Ground Clamp, eliminating loss of valuable welding current, will pay for itself in very little time. And because its price is low, you may be sure of *double economy* when you buy Jackson's.

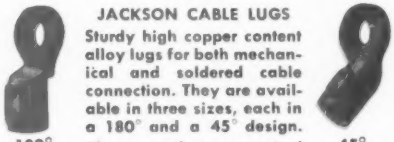


JACKSON "QUIK-TRIK" CABLE CONNECTORS

The safest way of making cable extensions. By connecting the female unit to the cable lead, the live cable end is always well insulated when not in use. Units lock tight by a twist of the hand. To avoid delays in your shop, keep your stock of replacement holders on hand with a length of cable and a male unit of the cable connector fastened to them. Then, if a holder needs replacing, get a spare and connect it in a minute.

JACKSON CABLE SPLICERS

Cable ends make adequate metal-to-metal contact with the copper alloy splicer, clamped, soldered, or brazed. For permanent, well insulated extensions; time saving, economical.



JACKSON CABLE LUGS

Sturdy high copper content alloy lugs for both mechanical and soldered cable connection. They are available in three sizes, each in a 180° and a 45° design.

Please specify type required

180° 45°

See your Jackson Distributor for prompt delivery
Also ask him about Jackson Electrode Holders, Eyeshields, and Safety Goggles

JACKSON
PRODUCTS
WARREN · MICHIGAN

MODEL	CABLE SIZE	CABLE CONNECTION	CAPACITY	GROUND CLAMP		CONNECTOR	SPLICER	LUG
				jaw opening	price	price	price	price
No. 1	4 thru 1/0	mechanical or soldered	300 amp	1⅛"	2.75	2.95	1.60	.80
No. 2/0	1/0 and 2/0	mechanical or soldered	500 amp	1¾"	3.50	3.75	1.85	.90
No. 4/0	3/0 and 4/0	soldered only	500 amp	1¾"	3.25	3.50	1.50	.80

The HOBART "Bantam Champs"

Bantam Champ 200 amp. electric drive

Bantam Champ 200 amp. gas drive

LOW IN COST, plenty o' "pepper"

Welding Speed on production, so vitally important to reducing the cost of your product, is definitely helped with this compact, willing unit. Modified multi-range dual control gives 500 combinations of welding current for selecting any desired arc characteristic. Operators like its "feel" and ease of handling. Result: More and better welding per day.

Big duty cycle assures you of getting your money's worth in actual capacity for useful welding. This machine is conservatively rated at 200 amps, with 50% duty cycle! It will pay you to check and compare.

Portable Mounting Optional at nominal extra price. Specially designed for easily moving welder from place to place in your factory or shop. Get details on this and many other features by mailing coupon today.

Buy on HOBART'S easy "Pays-for-itself" terms. Ask for particulars!

Handiest gas drive ever built

Take it anywhere. Go where welding is needed and profits are waiting. Just put it on your pickup truck (light in weight) or tow it on two wheeled trailer available at small extra cost. Ideal for emergency service and "on-the-job" welding where electric power is not available.

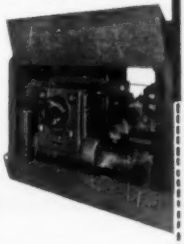
Low operating cost is made possible with 4-cylinder Industrial Engine and constant speed, gear driven governor. Send for more details.

HOBART A.C. - A.C. gives you electric power plus welding. Meet day to day welding needs with 200-300 amp. cap. welder, or flip a switch and operate tools, lights, motors with 5-8 kw. power. An outstanding unit in HOBART'S complete line of arc welders.

Trailer mounting for gas drive

Compare HOBART ... see how much MORE you get!

Your Best Buy . . . A.C.or D.C. No matter what your requirements for electric arc welders may be . . . electric drive, engine drive, or transformer type . . . direct current, alternating current or combination units with a-c or d-c auxiliary power . . . it will pay you to investigate HOBART, the largest and most complete line on the market.



HOBART "one of the world's largest builders of arc welders"

HOBART BROTHERS CO., Box U-60, **TROY, OHIO**

I'm interested in the "Bantam Champ" ☐ Electric Drive ☐ Gas Drive. Also send details on other items checked:

- ☐ A.C. Welder—A.C. Power Unit
- ☐ A.C. Drive D.C. Welders
- ☐ D.C. Welder—D.C. Power
- ☐ Gas Drive D.C. Welders
- ☐ D.C. Welder—A.C. Power
- ☐ A.C. Transformer Welders

NAME_____

FIRM_____

ADDRESS_____

HOBART Electrodes ☐ Check here for catalog on Electrodes made to most exacting specifications for A.C. and D.C. Welding of all types of metals.

HOBART Accessories ☐ Check here for catalog on complete line of helmets, protective clothing, electrode holders, tools, etc., which help to improve welding efficiency.

Mallory Alloy Resistance Welding Wheels

Play Vital Role In Large Tube Mills

Huge new resistance welders are in action . . . producing large-diameter tubing at an unprecedented rate. Such machines make unusual demands upon the welding wheels required to seal the thick-walled seams.

Giant wheels of Mallory 53B Metal have been selected for the job . . . because they are hard and strong enough to withstand the high pressures . . . because their high electrical and thermal conductivity insures efficient welding . . . because they rapidly dissipate heat . . . and because their extremely high resistance to annealing minimizes deformation and wear.

But, in addition, these wheels are delivering extra long, continuous service . . . without interruptions for dressing. This avoids production shut-downs, a boost to operating economy.

That's results beyond specification!

Mallory's resistance welding know-how is at your disposal. What Mallory has done for others, can be done for you!

MALLORY 53B METAL

Mallory 53B is a newly improved metal embodying recent engineering developments. Castings and forgings of improved Mallory 53B Metal are being used in numerous applications where a high strength, high electrical and thermal conductivity metal is required . . . such as spot welder arms, gun welder parts, water-cooled holders, seam welder spindles and bearings.

In Canada, made and sold by Johnson Matthey & Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

Resistance Welding Tips, Holders, Dies, Rod and Bars, Castings, Forgings

SERVING INDUSTRY WITH

Capacitors	Contacts
Controls	Resistors
Rectifiers	Vibrators
Special Switches	Power Supplies

Resistance Welding Materials

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

A McGRAW-HILL PUBLICATION

Volume 35 Number 6

A. M. Morris, *Publisher*
T. B. Jefferson, *Editor*
Clyde B. Clason, *Managing Editor*
William C. Henzlik, *Assistant Editor*
Jack I. Medoff, *Eastern Editor*
George B. Bryant, Jr., *Chief Washington Bureau*
Russell F. Anderson, *Editor World News*

C. H. Clarke
Eastern Manager, New York, Tel. LOngacre 4-3000

E. J. McOsker
Central Manager, Hanna Bldg., Cleveland
Tel. Superior 7000

Thomas H. Barry
Western Manager, Chicago, Tel. WHitehall 4-7900

Carl Dysinger
621 S. Hope Street, Los Angeles, Calif.
Tel. Michigan 3873

John Otterson
68 Post Street, San Francisco, Calif.
Tel. Douglas 4600

J. H. Allen, Jr.
First National Bank Bldg., Dallas, Tex.
Tel. Prospect 7-5064

John Doyle
Assistant to Manager

COPYRIGHT 1950 by All rights reserved
McGRAW-HILL PUBLISHING COMPANY, INC.
JAMES H. McGRAW
(1860-1948), Founder
CURTIS W. McGRAW
President
WILLARD CHEVALIER, *Executive Vice-President*
JOSEPH A. GERARDI, *Secretary and Treasurer*
PAUL MONTGOMERY, *Senior Vice-President, Publications Division*
NELSON BOND, *Vice-President and Director of Advertising*
J. E. BLACKBURN, JR., *Vice-President and Director of Circulation*

PUBLICATION OFFICE, 2nd S. Des Plaines St., Chicago 6. EDITORIAL OFFICE, 520 No. Michigan Ave., Chicago 11. EXECUTIVE OFFICES, 330 West 42nd St., New York 18, N. Y. Branch offices, Chicago, San Francisco, Washington, Philadelphia, Cleveland, Detroit, Pittsburgh, St. Louis, Boston, Atlanta, Los Angeles, Dallas. Published monthly with an additional directory number in June.

McGraw-Hill Publishing Company, Inc. Entered as second class matter Aug. 23, 1948, at the post office at Chicago, Ill., under the act of March 3, 1879.

Subscription rates:

Single copy 50c. United States and possessions, $5.00 per year, $8.00 for two years, $10.00 for three years. Canada $6.00 per year, $10.00 for two years, $12 for three years. Pan American countries $10.00 per year, $16.00 for two years, $20.00 for three years. All other countries $15.00 per year, $25.00 for two years, $30.00 for three years.

THE WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

JUNE, 1950

COVER: Sailing vessel is the "Silhouette," welded steel craft designed, built and owned by Harry W. Pierce, AWS vice-president. See page 17.

CONSTRUCTION

"We Built a Boat" **17**
HARRY W. PIERCE

SELLING

12 Self Assignments to Sales Success—II **22**
RICHARD C. BORDEN

RESEARCH

Welding, Brazing, Soldering Beryllium Copper—I ... **23**
J. T. RICHARDS

CONVENTIONS

NWSA Report **28**

2nd Electric Welding Conference **36**
CLYDE B. CLASON

OPERATION

Defects in Stainless-Steel Spot Welds **30**
PAUL F. DUVALL, ROBERT S. SMITH and FRANK E. CRAIG

Aluminum Studs Welded to Aluminum Plate **42**

PRODUCTION

Production Hard-facing of Rock Drills **32**
GERALD ELDRIDGE STEDMAN

MAINTENANCE

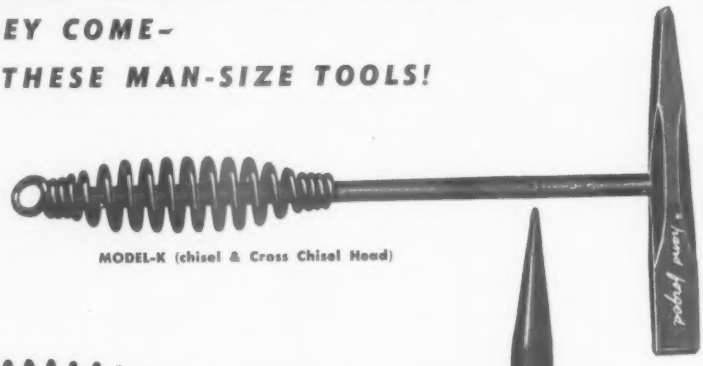
Inlays Welded on Old Turbine **43**

DEPARTMENTS

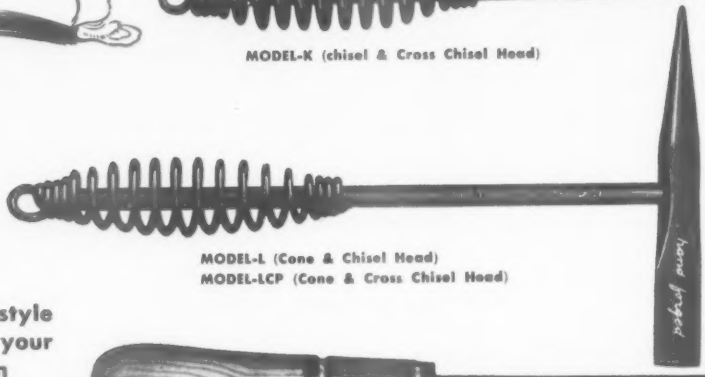
Editorial 15
New Products for Welding 44
Engineering Data Sheet No. 117 49
For Your Technical Library 51
On the Job 54
News of Welding and Welding Men 58
About People 75
30 Years Ago 77
From the Patent Office 78
Searchlight Section 83
Where to Buy 83
Advertisers in This Issue 84

ATLAS "HEAVY DUTY" TOMAHAWKS

TOUGH AS THEY COME—
THESE MAN-SIZE TOOLS!



MODEL-K (chisel & Cross Chisel Head)



MODEL-L (Cone & Chisel Head)
MODEL-LCP (Cone & Cross Chisel Head)

A head style to suit your needs in metal or wood handle.

MODEL-M (Chisel & Cross Chisel Head)

MODEL-N (Cone & Chisel Head)
MODEL-NCP (Cone & Cross Chisel Head)

LARGER, TOUGHER FOR HEAVY WORK

● The Atlas Tomahawks shown above are husky, man-size one pound tools for heavy work and embody all the features of standard weights —just larger in all dimensions.

These Tomahawks are standard in many shops where for the slight additional cost they prefer their longer life and ability to stand up in rough-tough usage.

Their hand forged, solar steel heads are silver brazed to the handles for safety. Next time you buy try one of these heavier models.

★ ***See your local welding supply dealer.***

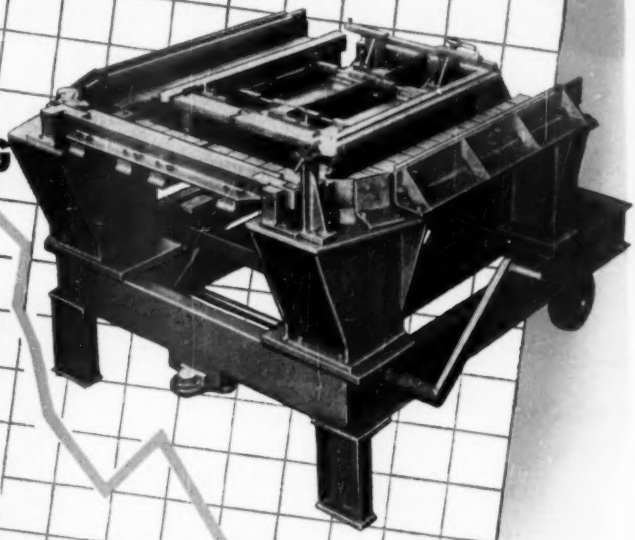
Atlas WELDING ACCESSORIES COMPANY

707 E. LEWISTON AVENUE FERNDALE 20, (DETROIT) MICHIGAN

watch production costs DROP!

WHEN YOU USE

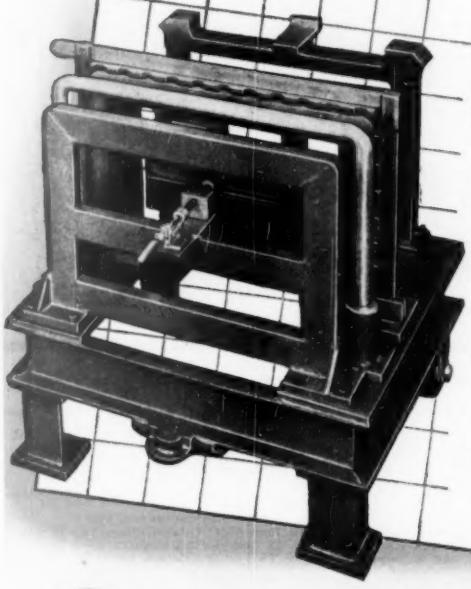
BUNELL SPECIAL* PROJECTION WELDING FIXTURES



* **BUILT TO YOUR SPECIFICATIONS**

The fixtures shown were designed and specially built by BUNELL for fast, easy assembly of space heater bodies by projection welding.

Similar fixtures—built to meet your requirements—can speed up your production and slash your unit costs.



BUNELL SPECIAL FIXTURES CUT ASSEMBLY TIME ON STOVE FRAMES, CABINETS, HEATER BODIES

On the special BUNELL Projection Welding Fixtures shown above, a total of 63 projection welds are made to assemble a complete space heater body in a fraction of the time formerly required.

Among the advantages of this type of BUNELL Fixture are: (1) Parts are welded in a stationary position, with much less handling of cumbersome assemblies. (2) Automatic location of welds. (3) One set of light, air-operated welding guns serve many different fixtures. (4) The fixture can be removed from the welding line by means of built-in casters, and a fixture for another model substituted.

BUNELL Projection Welding Fixtures can be built *for your particular requirements* on stoves, heaters, cabinets or similar sheet metal assemblies to save you time, trouble and money. Send your prints and specifications today for quotation—or write for full information.

WRITE FOR BULLETIN
which shows BUNELL facilities, methods and equipment

THE BUNELL MACHINE & TOOL CO. CLEVELAND, O.

BUNELL MACHINE AND TOOL CO.

1601 EAST 23rd STREET • CLEVELAND 14, OHIO

Since 1920, Designers and Builders of Special Tools, Dies, Jigs, Fixtures and Special Machines

2 New GE

Automatic "Hot-start" Control for Instant Arc Striking

*

G-E Silicone Insulation for Compactness,

New Model 6WK20H 200-amp a-c welder

200-AMP MODEL — $180†

Weighs 154 lbs.

This little welder gives you more welding amps per pound—and more value for your welding dollar than any other standard a-c welder available today. And it's still a hard-working industrial welder with a current range from 30 to 250 amps, ($\frac{1}{16}$"—$\frac{3}{16}$" electrodes) 30 volts, and 50% rated duty cycle.

23" high, 12" wide, and 17" deep, it's easily carried about, or tucked away in spaces too small for bulkier units. Its fully automatic "hot-start" gives instant arc striking on any current setting with no manual adjustment needed. Maintenance is easy and inexpensive, and you can weld many a job without having to tie up large units. Write your distributor for bulletin GEC-553.

†Unit price for zone 1 (eastern); prices slightly higher in zones 2, 3, 4.

GENERAL ELECTRIC

7H-80

ALABAMA—Young & Vann Supply Co. Box 2532, Birmingham; Turner Supply Co. Box 1429, Mobile
ARIZONA—Arizona Welding Equipment Co. 230 S. Central, Phoenix
CALIFORNIA—Victor Equipment Co. 844 Folsom, San Francisco
COLORADO—Hendrie & Bolthoff Co. 1635 17th St. Denver (also WYO.)
FLORIDA—Cameron & Barkley Co. 605 E. Forsyth, Jacksonville
GEORGIA—Welding Supply & Service Co. 295 Techwood Dr. NW, Atlanta; Georgia Oxygen Co. Box 1077, Macon
IDAHO—Olson Manufacturing Co. 4000 Warm Springs Ave., Boise
ILLINOIS—Machinery & Welder Corp. 1324 W. Fulton, Chicago (also IOWA)
INDIANA—Drill Master Supply Co. 1305 First Ave. Evansville; Sutton-Garten Co. 401 W. Vermont, Indianapolis; Perry Welding Sales & Service, 424 E. Monroe, South Bend
KANSAS—Watkins, Inc. 204 N. Waco, Wichita
KENTUCKY—G-E Supply Corp., Hoskins St., Harlan; Mine Service Co., Lothair; Reliable Welding Co. 630 S. 15th, Louisville; Big Sandy Electric & Supply Co., Pikeville
LOUISIANA—Equitable Equipment Co. 410 Camp, New Orleans; Hughes Welding Supply Co. 415 Fortson, Shreveport
MARYLAND—Arcway Equipment Co. 920 E. Fort Ave. Baltimore (also DEL.)
MASSACHUSETTS—General Electric Welding Sales, 9 Putnam St., Fitchburg (also MAINE, VERMONT, NEW HAMPSHIRE); Welding Engineering Sales Corp. 150 Causeway, Boston

a-c welders

Long Life, Light Weight

New Model 6WK30J 300-amp a-c welder

300-AMP MODEL — $310†

35″ high; weighs 325 lbs.

For heavier-duty applications, this model handles $\frac{3}{32}$″ to $\frac{1}{4}$″ electrodes (current range 40 to 375 amps), is rated at 40 volts with a 60% duty cycle. Only 19″ in diameter, it's really a miser on floor space.

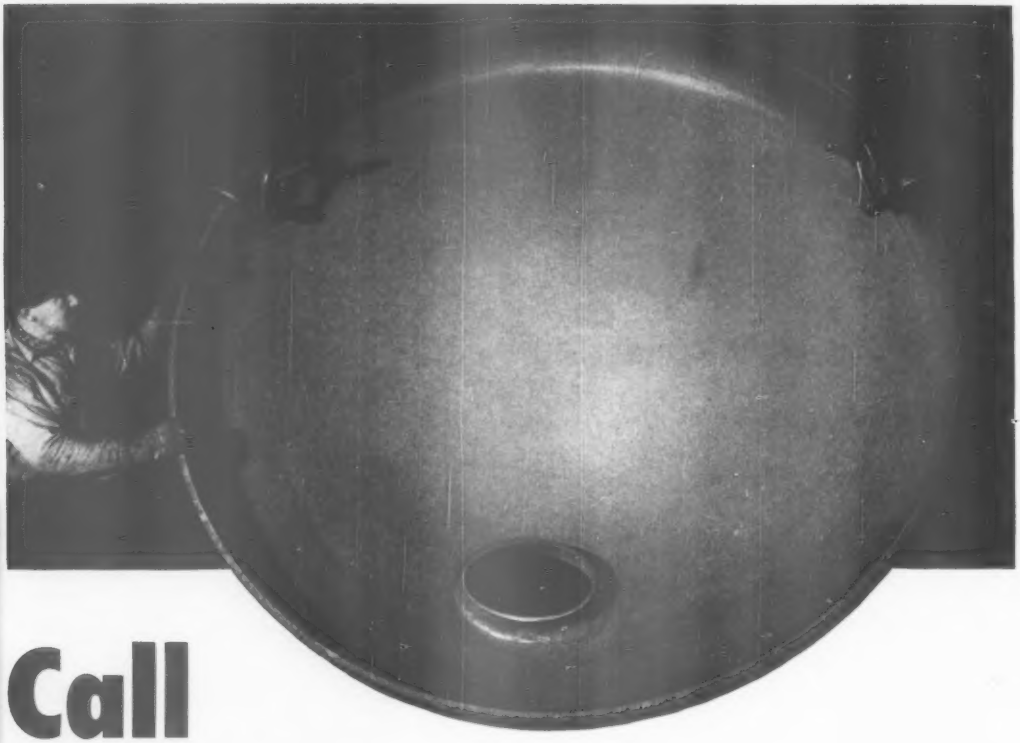
Excellent arc-striking characteristics (automatic "hot-start," of course) and elimination of popouts means faster welding, sounder welds, and lower operating costs. Its job range, running from light-duty, low-current sheet metal jobs to heavy-duty, high-current applications, make it an excellent all-around, general-purpose welder.

Ask your distributor for bulletin GEC-652. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

* *New, water-repellent, temperature-resisting, insulating material means increased operating dependability.*

SEE THEM AT THESE DISTRIBUTORS

MICHIGAN—Welding Sales & Engineering Co. 8750 Grinnell Ave. Detroit; Miller Welding Supply Co. 505 Fulton, Grand Rapids
MINNESOTA—Machinery & Welder Corp. 2440 2nd St. Minneapolis, W. P. & R. S. Mars Co. 324 W. Michigan, Duluth
MISSISSIPPI—Jackson Welding & Supply Co. 145 E. South St. Jackson
MISSOURI—Machinery & Welder Corp. 700 S. Spring, St. Louis (also IOWA); Hohenschild Welders Supply Co. 512 E. 18th, Kansas City (also KAN.)
MONTANA—Montana Hardware Co., 823 S. Montana, Butte
NEBRASKA—Lincoln Welding & Supply Co. 330 S. 10th, Lincoln; Baum Iron Co. 13th & Harney, Omaha (also IOWA)
NEW JERSEY (Northern)—Welding Engineering Sales Corp. 40 Goble St., Newark
NEW MEXICO—Industrial Supply Co. 1647 N. 2nd St. Albuquerque; Bowen Welding Supply, 1320 W. 7th, Clovis; Western Oxygen, Inc. 207 W. Dunham, Hobbs; Car Parts Depot, 302 N. Main, Las Cruces
NEW YORK—Welding Engineering Sales Corp. 110 E. 42nd, New York (also CONNECTICUT)
NORTH DAKOTA—Dakota Electric Supply Co. 1017-23 Fourth Ave. N., Fargo
OHIO—Burdett Oxygen Co. 3300 Lakeside, Cleveland; Menna Welding Co. 1102 West Central, Toledo
OKLAHOMA—General Electric Welding Div. 915 E. 2nd St. Tulsa
OREGON—J. E. Haseltine Co. 115 S. W. 2nd Ave. Portland
PENNSYLVANIA—Arcway Equipment Co. 49th & Grays Ave. Philadelphia (also Southern N. J.); 5118 Penn Ave., Pittsburgh
SOUTH CAROLINA—Cameron & Barkley Co. Box 906, Charleston; Welding Gas Products Co., 407 Fall, Greenville
SOUTH DAKOTA—Hendrie & Bolthoff Co. 629 Main, Deadwood
TENNESSEE—Welding Gas Products Co. Box 749, Chattanooga; Delta Oxygen Co. 611 Court, Memphis (also ARK.)
TEXAS—M & M Welding Supply Co. 1818 Butternut, Abilene; J. Ernest Stroud Co. 501 E. Third, Amarillo; Briggs-Weaver Machinery Co. 3000 Hines Blvd. Dallas; Dallas Welding Supply Co., 430 S. Industrial Blvd., Dallas; Car Parts Depot, Inc. 712 Texas, El Paso; Welding Equipment Co. 1413 E. Lancaster, Ft. Worth; Acetylene & Oxygen Co., Harlingen; General Electric Welding Div. 5931 Clinton Drive, Houston; West Texas Oxygen Co. 2607 Ave. "H," Lubbock; Western Oxygen, Inc. 2700 W. 2nd, Odessa; Plains Welding Supply Co. 221 E. 6th, Plainview; Southwestern Welding Supply Co. 65 East Ave. San Angelo; San Antonio Machine & Supply Co. Drawer 660, San Antonio; Hughes Welding Supply Co. 2007 W. 7th, Texarkana (also ARK.)
UTAH—The Galigher Co. 545 W. 8th South, Salt Lake City
VIRGINIA—Arcway Equipment Co., 5931 Madison, Newport News
WASHINGTON—J. E. Haseltine Co., 510 First Ave. S. Seattle
WEST VIRGINIA—Bluefield Supply Co., Bluefield; Virginian Electric Inc. 57 Michigan, Charleston; Logan Hardware & Supply Co., Logan
WISCONSIN—Machinery & Welder Corp., 3623 W. National Ave. Milwaukee
ALASKA—Northern Supply Co., Anchorage
HAWAII—W. A. Ramsey, Ltd. Box 1721, Honolulu
CANADA—Canadian General Electric Co., Toronto
OTHER FOREIGN COUNTRIES—International General Electric Co.



Call Bethlehem for Flanged-and-Dished Products

HEADS

Flanged-Only
Standard Flanged-and-Dished
Shallow Flanged-and-Dished
ASME Code Flanged-and-Dished
Elliptical
Tank-Car
Obround-Tank
Double-Dished

Standard Manholes and Covers
Hand Holes and Covers
Flue Holes
Collar Flanges
Pipe Flanges

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

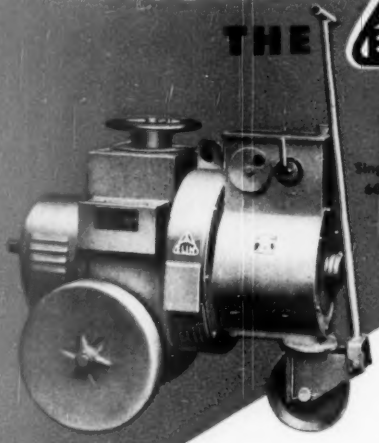
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

CLINCHER *for New Welding Efficiency!*

THE ELIN D-C ARC WELDER

FEATURING THE CROSS FIELD AMPLIDYNE



Model EFN 300

Single Operator 60-375 amp — Motor-Driven 1750 rpm

FULL NEMA RATING

Just watch this easy-breathing d-c welder in action — you'll be sold in a minute. For here's the latest and "best yet" in modern arc welder performance.

Even if you only highspot its design, you'll see how Elin, first name in European welding equipment, has assured superior, speedier welding — at lower cost — all the way.

Effortless control . . . a peppier, steadier arc . . . uniform penetration . . . instantaneous voltage recovery . . . absence of electrode sticking — these are simply hints of the big plus in performance that's in store for you.

For the complete story on the Elin Welder . . . for your new experience in welding efficiency — let us put you in touch with the distributor in your locality.

PROMPT DELIVERY — SPARE PARTS IN STOCK!

ELIN EFFICIENCY — *Right in the design!*

Here's a sample of Elin's patented package.

COMPACT. Motor and generator, for instance, are built into a single unit. No cumbersome auxiliaries.

STEPLESS, LOSS-FREE REGULATION of the welding current over the entire current range.

PORTABLE. A lightweight machine, but sturdy, arc welded throughout.

VENTILATED for cool operation in toughest service.

DRIP-PROOF ENCLOSURE — all parts fully-insulated.

A few choice territories still open to interested distributors!

american **ELIN** corporation

Welding Machinery Division

ONE WALL STREET • NEW YORK 5, N. Y.

NEW BOOK

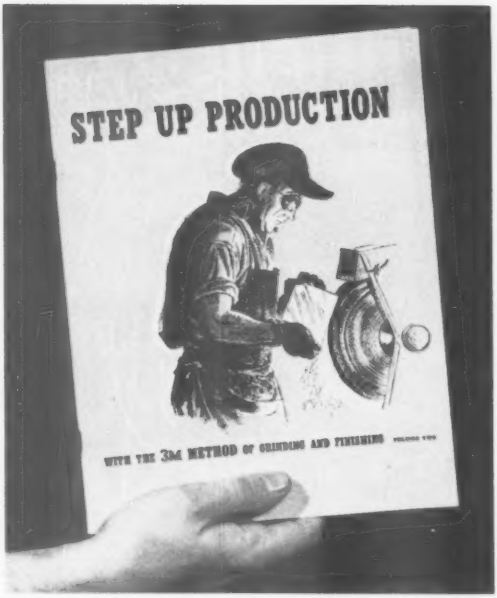
Shows how to cut grinding and finishing costs

Copies now available . . .
. . . yours for the asking

This new booklet covers the subject of industrial grinding and finishing from all angles, through a series of "case histories" taken straight from the production line. Here's the aggregate of 3M's practical experience with belt grinding installations. 36 picture-filled pages showing how to step up your output and cut your unit cost by converting your present equipment to the 3M Method of Grinding and Finishing. Send for your FREE copy today!

READ "CASE HISTORIES" COVERING:

- Foundry grinding
- Aluminum grinding and finishing
- Grinding and finishing brass and bronze
- Cold rolled steel grinding and polishing
- Grinding forged and heat-treated steel
- Sanding and smoothing woods and plastics
- Pre-finishing of steel in the flat
- Stainless steel grinding and polishing
- Polishing tubing inside and outside
- Grinding and seaming glass



$20,000 SAVED IN ONE YEAR . . . 3-step operation cut to one . . . equipment pays for itself in thirty days! These are samples of the results cited in this new 36 page brochure covering the subject of grinding and finishing with 3M Belts.

FREE BOOK tells about 3M's plant survey service. Learn how you can convert present equipment to the 3M System of Grinding and Finishing. Send for your FREE copy today.

MAIL THIS COUPON TODAY FOR YOUR FREE COPY OF "STEP UP PRODUCTION"

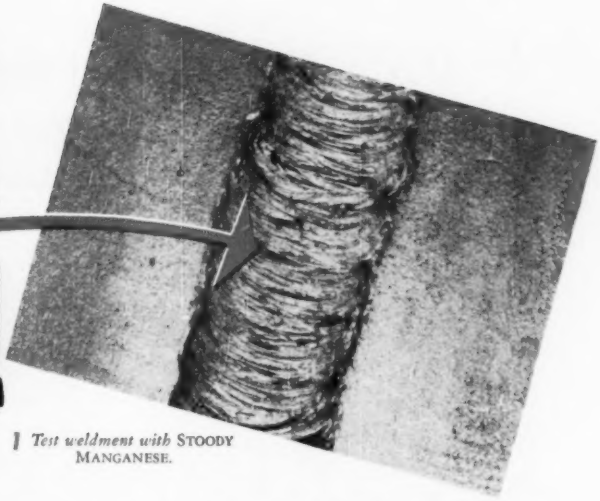
MINNESOTA MINING & MFG. CO.,
St. Paul 6, Minn. WE650

Name .....
Title .....
Firm name .....
Address .....
City ..... Zone ..... State .....

Made in U.S.A. by MINNESOTA MINING & MFG. CO., St. Paul 6, Minn., also makers of "Scotch" Brand Pressure-sensitive Tapes, "Scotch" Sound Recording Tape, "Underseal" Rubberized Coating, "Scotchlite" Reflective Sheeting, "Safety-Walk" Non-Slip Surfacing, "3M" Adhesives.

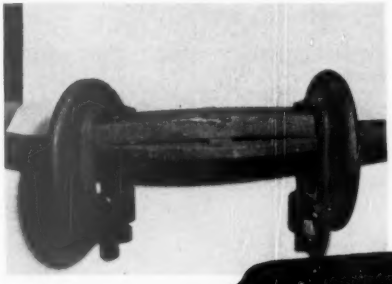
General Export: DUREX ABRASIVES CORP., *New Rochelle, N.Y.* • *In Canada:* CANADIAN DUREX ABRASIVES LTD., *Brantford, Ontario*

LOOK no cracks!



1 Test weldment with STOODY MANGANESE.

2 Manganese plates beveled and ready to weld.



3 Warpage is counteracted with husky "C" clamps.

A simple test that proves Superiority of STOODY MANGANESE!

Experienced welders fully recognize the "feel" of a good electrode . . . with the new STOODY MANGANESE it's a faster, snappier action, improved speed of deposit, good looking bead, and low spatter loss.

But if you want to SEE the superiority of STOODY MANGANESE . . . if you want to prove its exceptional resistance to cracking, try this simple test!

Bevel two ¾" manganese plates for vee-groove welding. Shim under the beveled edges to produce a slight reverse bow, such as would normally be allowed for contraction.

Now restrain the ends with husky "C" clamps and fill the vee with STOODY MANGANESE. Since the test pieces cannot move, the contraction strain is obviously placed on the weldment itself. NOTE THE COMPLETE ABSENCE OF CRACKS! Try this with any other bare manganese and compare results.

WHAT THE TEST PROVES: Absence of cracking indicates unusually high ductility, a quality in STOODY MANGANESE which insures extra strength . . . keeps welded parts WELDED where unusual shock and impact are encountered.

4 This finished test piece has been deformed in a press, placing STOODY MANGANESE *weldment under severe tension. Note degree of distortion sustained before crack develops.*

STOODY MANGANESE is also an excellent build-up rod. And it's low enough in cost to use both for strength welds and build-ups with economy! Try STOODY MANGANESE . . . Your STOODY Dealer can supply you.

STOODY COMPANY 11941 East Slauson Avenue, Whittier, California

AO Makes the Gloves and Mittens

that both PLEASE and PROTECT WELDERS

AO Safety Gloves — Mittens

Here are four popular leaders from AO's full line of safety gloves and mittens for welders. You can't buy more serviceable and comfortable hand protection!

5X163 GLOVE
Long a favorite for gas welding and the heaviest amperage welding, this glove of chrome-tanned split horsehide leather provides exceptional heat resistance without excess bulk. One-piece back and palm. All vulnerable seams welted for extra protection. Lining on back of hand is extra heavy.

6X141 MITTEN Chrome-tanned cowhide. One-piece back and palm. Thumb crotch strengthened by leather strap. The back of the hand of this highly serviceable 14" glove is lined. All seams subject to heavy wear are welted. Companion model 6X142 is identical except that it is a one-finger mitten.

3003 ONE-FINGER MITTEN
Sleeves tuck into these long, 13-inch mittens to protect forearms. One-piece back and palm. Reinforcing leather strap around thumb crotch. Back of hand is lined to prevent chafing. If full mitten is desired, ask for model No. 3004. Both models chrome-tanned cowhide.

TX200 GLOVE Newest in the line, this economical chrome-tanned cowhide glove is standard length, gunn style with welted seam at base of palm and wrist. Lightweight. One-piece back and wing thumb give fuller palm, lessen hand fatigue. An excellent protection "buy"!

American Optical Company
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

SUPER-DUTY CUTTING OUTFIT No. 8
Complete and ready to use, consisting of famous "75" Torch with Stainless Steel Head; No. 53 Cutting Tip (will cut up to 1¼-in.); 5902 Heavy-Duty Single-Stage Oxygen Regulator; 5905 Acetylene Regulator; 8-25-ft. lengths Hose with Connections; Torch Wrench, Regulator Wrench; Friction Lighter; Goggles; Cutting Guide. Only $99.60.

want better cutting at less cost?

"TORCHWELD 75"

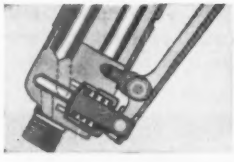
The heavy duty cutting torch that gives faster, cleaner cuts... longer, more economical service

There's no other torch on the market with all the refinements of the "Torchweld 75". It's designed better, and built better to work better for you.

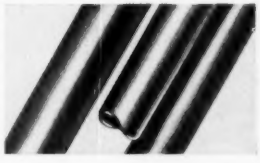
Time after time in shops, foundries and metal salvage yards where heavy work and rough use is the rule, it's the "75" that's preferred. Yet despite its ruggedness, the "75" performs with knife-like precision. It cuts clean edges with an absolute minimum of kerf. It cuts faster. It cuts easier.

All this means savings—savings in working time, in materials, in gas consumption, in maintenance—savings that add up to an impressive figure during the "75's" long useful life.

Available with stainless steel head at $35.00; with forged bronze at $29.00—at your nearest NCG office or dealer. Write for Catalog NTW-110 for complete details on the famous "75" and other quality Torchweld apparatus.



Leakproof Diaphragm Valve is the simplest, safest, most economical type of high pressure oxygen control ever designed. Stainless steel control lever and bearing provide smooth sensitive action.



Triangular Tube Construction gives exceptional rigidity and strength. Tubes are silver-brazed to head and body for maximum durability. Accurate needle-valves have stainless steel conical stems.

Write for Catalog NTW-110

NATIONAL CYLINDER GAS COMPANY
Executive Offices:
856 North Michigan Avenue, Chicago 11, Ill.

NCG
EVERYTHING FOR WELDING

Choice of Heads—rugged stainless steel or husky forged bronze. Faster safer non-flash tip-mixing principle. Accurately swaged tips assure unrestricted flow of gases, actually toughen with use.

Copr. 1950, National Cylinder Gas Co.

CLIP AND MAIL THIS COUPON TODAY

NATIONAL CYLINDER GAS COMPANY
856 N. Michigan Ave., Chicago 11, Illinois
Please rush me a free copy of NCG Catalog NTW-110 containing full information on "75" Cutting Torch and other quality TORCHWELD apparatus.

NAME_____
POSITION_____
FIRM_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

KNOW ABOUT *NEW* "FLEETWELD 72" for high speed production welding?

● **Welds Faster.** Operates efficiently over a wider current range than conventional E-6012 electrodes. Operates best at currents substantially above conventional E-6012 rods . . . and without overheating.

● **Welds Easier.** Unique arc characteristics assure proper root penetration on fillet welds without sacrificing speed . . . minimizes the danger of cutting away the top edge on lap welds (Fig. 2).

● **Goes Farther.** "Fleetweld 72's" near flat bead shape (Fig. 1) means maximum weld strength without excess weld metal . . . eliminates piling up of weld metal so common with other E-6012 electrodes to give greater weld length per rod.

● **Ideal On Poor Fitup.** Permits easy bridging across gaps at high currents and high speeds without burning through parent metal to simplify fabrication and fitting of parts in fixtures for welded assembly.

● **Needs Less Cleaning.** Smooth, uniform operation over broader current range minimizes spatter . . . On many types of work, slag is practically self-cleaning.

● **Premium Performance At No Extra Cost.** New "Fleetweld 72" combines the benefits of greater ease in producing properly shaped bead with higher welding speeds to cut your welding costs . . . *yet new "Fleetweld 72" sells at no increase in price* over its famous E-6012 welding partner "Fleetweld 7".

Available in 1/8, 5/32, 3/16, 7/32, 1/4, 5/16 *diameter. For use with AC or DC.*

VERSATILE FOR WIDE RANGE OF WORK as in the fabrication of machinery parts, automobile frames and bodies, storage tanks, shop fabrication of structural members . . . and for all types of flat-position repetitive work where duplicate welds must be made in a minimum of time.

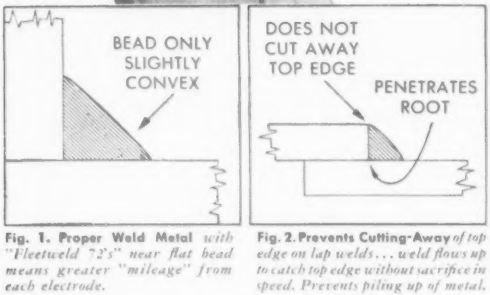


Fig. 1. Proper Weld Metal *with "Fleetweld 72's" near flat bead means greater "mileage" from each electrode.*

Fig. 2. Prevents Cutting-Away *of top edge on lap welds . . . weld flows up to catch top edge without sacrifice in speed. Prevents piling up of metal.*

GET THE FACTS

Write for free Procedure Bulletin

THE LINCOLN ELECTRIC COMPANY
Dept. 76, Cleveland 1, Ohio

Sales Offices and Field Service Shops in All Principal Cities

LINCOLN

ESTABLISHED 1916 THE WELDING ENGINEER JUNE, 1950

Let's Tell the World

WE'LL BRAG ABOUT our children, the length of the fish we catch (or that get away), the mileage we are getting from our new car, but we are as dumb as a wooden Indian when it comes to bragging about welding.

You'd almost think welding was a racket of some kind the way people who are making their living out of it shy away from talking about it. Doctors and lawyers discuss their cases; the grocer and the butcher never hesitates to tell you how he runs his shop. But when you tell someone you are in the welding business, he says, "Oh," and that's the end of it. You let it lie there. But you should carry on. You ought to follow up by telling him how important welding is to all Americans.

It is, you know, and we can prove it.

Not so long ago THE WELDING ENGINEER made a survey of American industry. We found that more than 85% of our industrial plants were using welding for either maintenance or production purposes —or both. Of the plants using welding, 91% used it in maintenance applications.

These plants were kept in operation more hours of the day with minimum delay and minimum expense because of welding. Let's tell our friends and neighbors about some of these little known uses of our "magic joining" process. Maybe they'd find it even more interesting conversation than little Johnny's new tooth or your golf scores or the fact than on the last trip your car averaged 18.55 miles per gallon.

Without welding for maintenance, our present-day economy couldn't be continued. Say that you had to replace every broken or worn part by a new part instead of welding it. Repairs that now take hours or minutes would take days, weeks or months. Industry would soon be in chaos.

Among first failures would be heavy-wearing parts in transportation systems. These failures would curtail the delivery of raw materials to plants and thus limit production. Each successive step of industrial activity would suffer greater and greater ravages as wear unhampered by welded repairs went on like a chain reaction. Fewer trains, fewer cars, fewer buses and trucks, fewer machines running in factories, assembly lines stalled . . . all this might happen if we should suddenly find ourselves without maintenance welding.

Fortunately, that nightmare isn't likely to occur. Welding is here to stay in maintenance.

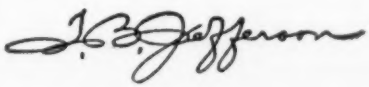
Production welding is another subject on which we might talk. According to THE WELDING ENGINEER survey, 71% of the plants using welding used it for production purposes. Some of these plants are making products that can only be produced because of welding. Other products would be vastly more costly if they had to be made by other methods.

Your friend's automobile, for example, would cost at least a thousand dollars more if it were joined by other fabrication methods. That's something you might talk about since everybody but certain politicians is interested in saving a thousand dollars.

And every auto needs gas. The high-octane gasoline that's an absolute essential for aircraft and autos with high-compression engines couldn't be made without vessels capable of withstanding high temperatures and pressures. Welding has been found to be the only satisfactory joining method for the high-pressure stills producing high-octane gasoline.

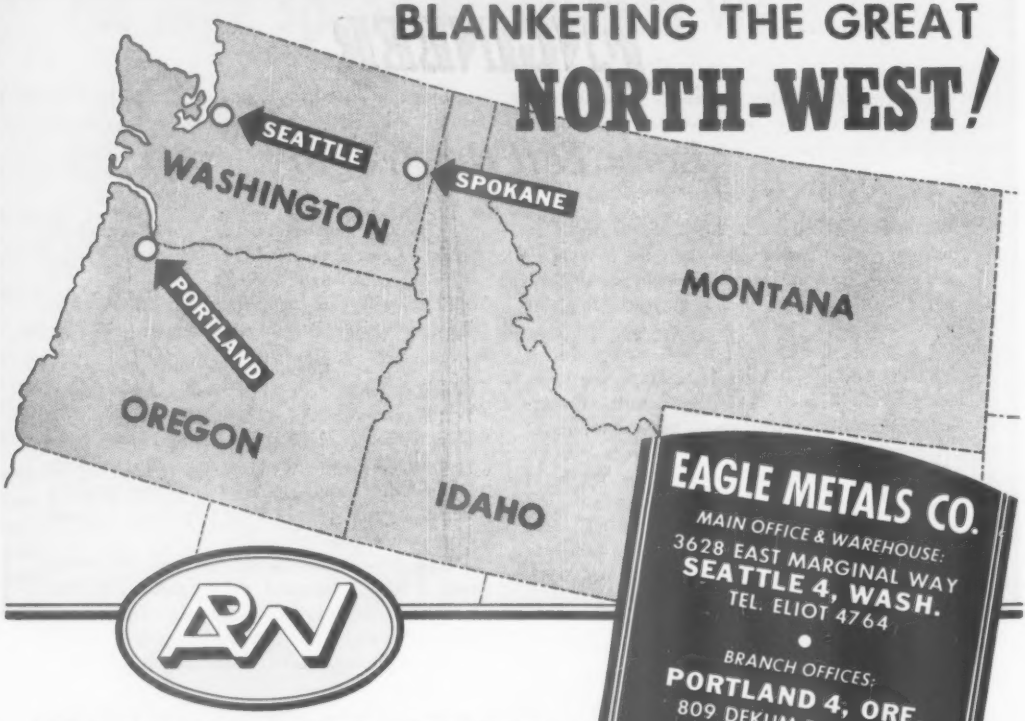
The tiny filaments in light bulbs and radio tubes are also welded on a production basis. Result is that they are cheaper and much more satisfactory. You can tell your friends about that—and almost countless other interesting and useful applications of welding.

Welding is quiet in industry, but that's no reason why we should be quiet about it. Welded steel structures rise silently in our cities, but we don't have to be silent about them. Let's tell the world about the virtues and advantages of welding. Then the world will want more welding, don't you think?



Announcing...a New Silvaloy Distributor

BLANKETING THE GREAT NORTH-WEST!



EAGLE METALS CO.

MAIN OFFICE & WAREHOUSE:
3628 EAST MARGINAL WAY
SEATTLE 4, WASH.
TEL. ELIOT 4764

BRANCH OFFICES:
PORTLAND 4, ORE.
809 DEKUM BUILDING
TEL. ATWATER 4962

SPOKANE 8, WASH.
EAST 41 GRAY AVENUE
TEL. MADISON 2419

SILVALOY
SILVER BRAZING ALLOYS

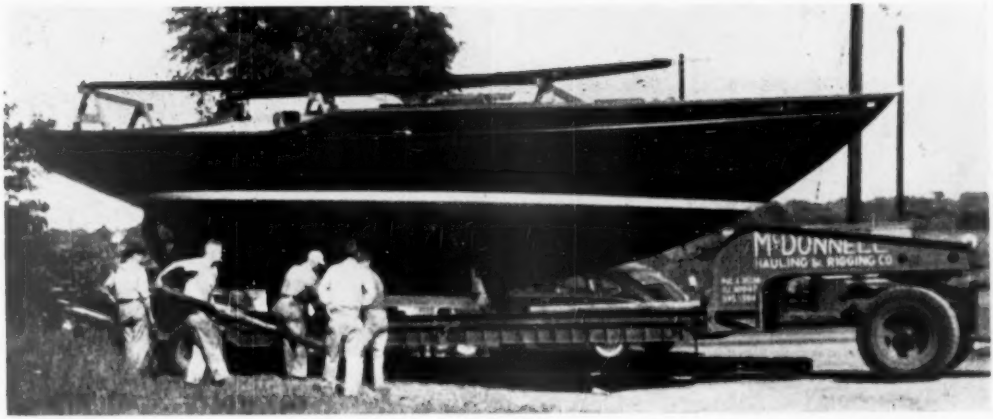
Eagle Metals Company, well-known as leading distributors of metal products in the Northwest, has undertaken the distribution of SILVALOY Silver Brazing Alloys. Manufacturers located in this area will benefit greatly from the speedy delivery possible from nearby on-the-spot stocks. SILVALOY Alloys cover all silver brazing requirements and Eagle Metals Company will not only furnish complete data, but also co-operate closely with you in deciding which alloy fits your specific type of production.

The table at the right indicates the characteristics of the most widely used SILVALOY Silver Brazing Alloys. For special applications we have a complete line of other silver brazing alloys with different characteristics. See your nearest distributor for complete information, or write us.

	SILVER CONTENT	MELTING POINT	FLOW POINT
SILVALOY 15	15%	1185°F	1280°F
SILVALOY 20	20%	1430°F	1500°F
SILVALOY 35	35%	1125°F	1295°F
SILVALOY 40	40%	1135°F	1205°F
SILVALOY 45	45%	1125°F	1145°F
SILVALOY 50	50%	1160°F	1175°F

APW No. 1200 Universal Flux recommended for use with these alloys.

THE AMERICAN PLATINUM WORKS
231 NEW JERSEY R. R. AVENUE NEWARK 5, N. J.



MASTS AND SPARS were stowed on deck as a tractor hauled *Silhouette* to the river for her first run to the yacht basin

"We Built a Boat"

BY HARRY W. PIERCE

Assistant to the President,
New York Shipbuilding Corp., Camden, N. J.

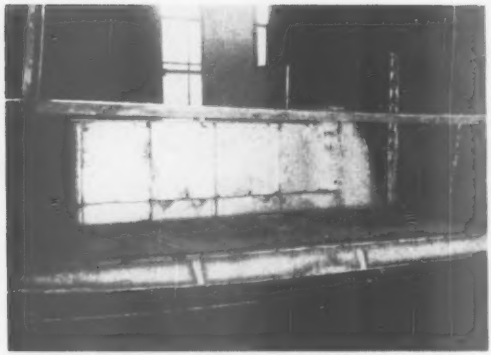
First vice-president of AWS, Harry W. Pierce knows enough about designing for welding to give a course on it at last year's convention of the American Welding Society. He also knows something about shipbuilding (understatement). When he applied his own ideas to a boat of his own, the result was *Silhouette.* This welded steel lady is a glamour girl (see picture on front cover), but she's as good as she is beautiful, claims her owner-designer-builder.

For a good many years the writer has been identified with steel shipbuilding, and particularly with the application of welding to ship construction. For just about as many years, he has looked forward to the day when he could have a comfortable cruising auxiliary. Naturally, a welded steel hull got a lot of consideration in his preliminary plans.

Came an opportunity to use a small job welding shop, conveniently located with respect to both the writer's home and the shipyard if not in respect to water. The owners wanted to try building a steel boat. A fine loftsman who likewise liked little boats next joined the group. So a sort of postman's holiday began—on a couple of nights a week and on Saturdays we would gather at the old shop and go to work.

Some jobs were, of course, beyond the capacity of the shop or required special equipment such as rolls, brakes or a press. These were contracted to the shipyard or to one of a number of nearby metal-working shops. Our little group, however, did all of the erection and a very considerable part of the fabrication at the site. Our tools were a cutting torch, a few arc welders, portable drills and grinders and an invaluable small air compressor to operate a pneumatic hammer for chipping, peening and grinding.

The very considerable advantages of the steel hull for boats large enough to use an easily welded thickness of plate have been well covered: water-tightness, strength for weight, low cost of material. Since steel boats are no longer a novelty, many are equally familiar with some of their disadvantages or limitations. Steel plate (or aluminum or plywood for that matter) develops expensive habits when compound curvature is attempted. But the normal boat designed for conventional wood plank construction is likely to have a very large proportion of just such curvature in the shell. Since it's so costly to get these shapes by furnacing, pressing, cold working or by the use of excessively narrow plates, most steel boat builders have resorted to "developable" surfaces; *i.e.*, conical or cylindrical surfaces (singly or in combination) for the areas between the keel and chines and from chine to gunwale. Properly designed and executed, smart craft with good performance can be turned out. Much of the pleasure of boat owning, however, comes from the eye appeal of shapes and curves not compatible



LAYING OF KEEL starts every shipbuilding operation. Here are keel, centerboard trunk and bulkheads

A LATER STAGE of construction shows the 45-gallon fresh-water tanks looking down on them from above

Growth of the *Silhouette* as told in pictures—from her keel structure to

with hard chine lines and the often boxy appearance of the developable side plating.

That Problem of Shrinkage

Welded construction in light weights of plating has another undeniable disadvantage: the distortion due to shrinkage in the weld and adjacent metal. This is perhaps more of a handicap even than the matter of compound curvature. Years of experience in dealing with shrinkage, distortion and stress problems, however, had led me to the conviction that within certain limits and careful control, "the devil might some useful work perform." In short, perhaps welding and torch-cutting shrinkage could be made to give us the curves desired in the right places instead of the ones which occasion such remarks as, "Oh, she has a steel hull, eh?" accompanied with a roller-coaster wave of the hand. Or, "How much cement to fair her up?"

It is immaterial whether *Silhouette* was built in the interest of science to check these theories or just because of the writer's desire for a boat of her type. Both objectives were achieved. If a bit short of her designer-builder's goal, the hull has at least confounded a goodly number of skeptics. The sweetest praise comes from the fact that she is rarely identified as a metal boat.

The general specifications called for an auxiliary suitable for Chesapeake Bay (but not restricted to that fine body of water). She must be capable of being handled by the writer and his wife under all conditions, be comfortable cruising for four and if a couple more could be smuggled aboard for a week-end, so much the better. Comparatively shallow draft, too, for the water in the Chesapeake is spread a bit thin in some of the most delightful spots. More than four feet denies entrance to some of the best anchorages, but that much can be carried enough places to satisfy any but the true "gunk-holer."

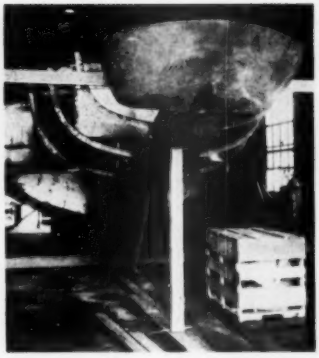
Around 28 ft on the waterline seems to take some of the punch out of the chop that is so common when wind meets tide and permits some of the longer jumps without starting too early and finishing too late. *Silhouette* is a combination keel and centerboarder. A lateral plane is ample for most sailing, but a good centerboard adds windward ability. The centerboard is also an excellent automatic sounding machine, and its warning that the bottom is getting close to the top prevents a more serious grounding.

Far from introducing a structural complication and probable source of leakage, the centerboard trunk in a steel boat is simple, tight and a structural member. If there is any necessity, a bolted cover plate permits the trunk to be opened. The board, which is of $\frac{1}{2}$-in. steel plate, can be removed without hauling it out; this was accomplished by welding a short pin into the pivot point of the board, and resting this on semi-circular blocks welded to the inside of the trunk. When the lifting gear is disconnected, the board is free to be lifted up into the cabin.

Limiting of the draft made greater beam inevitable. Whatever its effect on speed, beam is certainly what makes a boat livable. *Silhouette's* 11-ft beam permits permanent berths outboard of the transom seats in the main cabin. The transoms are an extension type, providing for the extra pair on week-ends. With four aboard, all have berths used for no other purpose. Why there aren't more raised-deck boats to give adequate room over these outboard berths is a puzzle to me. It's wonderful to be able to sit up without cracking your skull, to look out the fixed port in the side and check wind or tide, to have ample ventilation and a sense of spaciousness on entering the cabin. The raised deck simplifies both building and trim, and what a grand area of deck it provides! There is ample space to handle the dinghy, sails or just to sprawl out on and loaf without being a doormat.

The lines of *Silhouette* were developed on the basis of the foregoing waterline, beam and draft specifications. They are pretty much normal for the type, on the heavy displacement side. The main point is that the lines, good or bad, were worked up without regard to the material or any limitations on curvature. The primary consideration was cruising comfort, but it was hoped that she could at least keep out of the way. A few informal races indicate that with racing canvas and proper handling she won't do at all badly. Performance under power and maneu-

HULL FRAMING complete, ready for the plating. A view from bow



STERN VIEW of framing. Note the double curvature of the fantail

FIRST PLATE and one with maximum curvature in both directions

hull framing to the application of curved plating

verability exceeded all expectations. The direct-connected engine, turning up to 1,500 rpm, gives a very solid 6½ knots at 23,000 pounds displacement.

A bit more than the usual care—and time—was put into the loft work in fairing and developing a complete body plan. It included every station on which there was either a frame or bulkhead. The body plan was scribed on a section of flooring that could be moved right into the shop, serving as an oldtime scrieve board for frame bending as well as the Bible for all further work. An accurate half model to ¾-in. scale was also made to facilitate shell layout. This model allowed us to determine whether or not each plate was within the approximate limits of shrink-forming. We wanted to use ⅛-in. plating above the 4-ft waterline and 3/16-in. from that line to the top of the garboards at the 18-in. waterline. Other considerations, principally the forming method, limited plating to a length of 8 ft and a width of 3 ft.

Framing the Hull

Primary framing consisted of T-sections built up of ⅛-in. webs with 3/16-in. face plates intermittently welded. We gained a maximum moment of inertia and ample strength with a depth of only a little more than 2 in. The web members were edge bent cold, and the face plates easily sprung to that shape. Bulkheads were gotten out to size, and the trick of flanged joints (with welds lightly peened) kept them perfectly flat until the final shell welding began.

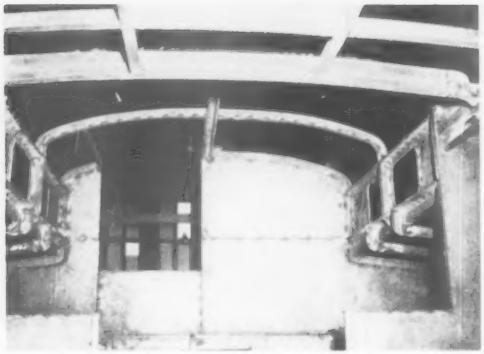
The framing system is a combination of longitudinal and transverse, the reason being that any deviation from nearly square panels increases the tendency to buckle on welding. All seams and butts land on primary stiffening members—another lesson learned the hard way on big ships. The 3/16-in. plating below the waterline was thick enough (in conjunction with its curvature) to require no further stiffening; panels were approximately 2 ft square. The ⅛-in. plate above is far harder to form and requires intermediate stiffeners. These were simply ⅛ by 1 in. flat bars, edge bent to shape. Panels of about 1 ft square proved adequate. There is a sound-deadening character to this construction that removes the curse of overly large unstiffened panels frequently seen (and heard).

The heavy keel structure presented no particular welding problems. We welded it with E-6010 electrodes. Following assembly of the keel and garboard structure and the centerboard trunk, the entire framing system was erected, including the deck beams. Considerable care and time had to be taken to get the members as perfectly aligned as possible and absolutely fair. All intersections were welded and every point rechecked. This precaution amply paid for itself in the plating. Layout templates for each shell plate were lifted directly from the completed framing. For the most part, we required only one template for both port and starboard, minor deviations in outline between port and starboard were merely indicated on the one template. The roll templates for transverse curvature were taken off the body plan.

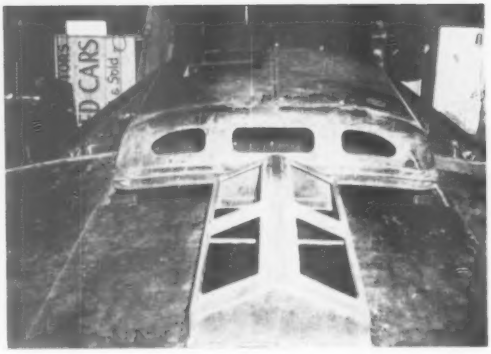
PLATING (3/16 in.) has now been completed to the waterline of boat

Forming Compound Curvature

Every plate has compound curvature. The forming was accomplished by variations of an old smith's trick—it was used to a limited extent in one or two of the wartime shipyards that did not have adequate plate furnacing equipment. Basically, we slightly underrolled the plate to get transverse shape, laid out the cut edges accurately and then shrunk the longitudinal edges while the plate is stressed. The curvature thus obtained is a function of the plate weight and proportions, the stress and heat control. The rate of heat-



DOGHOUSE and deck framing. Compare this view with picture to the right. Doghouse is of light-gage steel



DECK PLATING has been nearly completed in this picture, while skylight and doghouse are also in place

ing and cooling is largely a matter of torch size and speed. This process essentially depends on skill and judgment, but it was quick and accomplished the desired result. As in the case of the rolling, the plate is left with edges a bit slack, to be sprung into place with clamps, because the final welding of the seams and butts gives slight additional curvature.

The 3/16-in. plating (due to its greater stiffness and resistance to local buckling) was much easier to work by this method than the 1/8-in. A good deal of care had to be used with the lighter plating to avoid local crippling.

Welds at Low Heat

As each plate was applied, all welding was completed. We put emphasis on as little heat input as possible. If you want to control the distortion of light plate, there is no substitute for the smallest practicable electrode. On *Silhouette*, all framing connections and shell were welded with 3/32-in. and 7/64-in. E-6013 electrodes, using predominantly straight polarity d-c. Every effort was made to keep the structure cool and distribute the heat, and weld sizes were kept as small as practicable.

Keep the structure cool! Weld sizes should be the smallest possible consistent with strength and complete fusion. The average job is overwelded. Intermittent welding is an absolute must, except on butts and seams of the shell and the boundaries of tanks and watertight bulkheads.

All shell seams and butts of *Silhouette* were butt joints, and the outside surface of the plating was chipped and ground flush. As previously noted, all joints land on framing members; in the case of both the 3/16-in. and 11-gage plating, the shell plates land on 1/8-in. by 1/2-in. butt straps intermittently welded to the framing member. Theory was that this "landing" would facilitate lining up of the butts, give us a little more leeway in the fitting-up and would reduce shrinkage and hence change of shape in the framing member. Facts checked with theory, for exceedingly little change could be found after welding. The straps were quite unnecessary, though, as far as alignment and fitting-up were concerned. If these were the only considerations, they could well have been eliminated to save their cost.

Peening Helps Too

The final step in distortion control and a good ace in the hole is peening. Since the trouble is due to shrinkage at (but chiefly along) the weld, the most effective correction is to stretch the joint back to its original length. And it can be done, sometimes with remarkably little time and effort but with a lot of know-how.

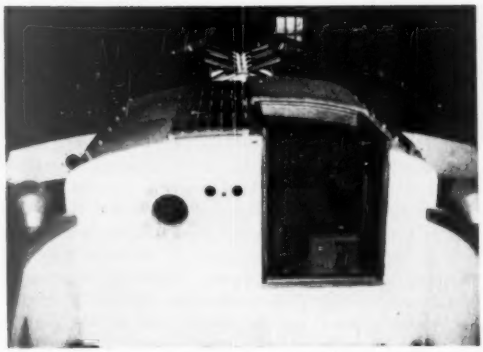
The final result, in this case, could have been better. The shell of a boat, well painted, is a critical surface, and the slightest unfairness can be readily picked up by an eye looking for variations. However, no cementing was needed below the waterline on the heavier plating. Less than a gallon was used above, and most of that in two areas where a few lessons were again learned the hard way. Since *Silhouette* requires nearly a gallon of paint for one complete coat above the waterline, the ratio isn't too bad.

The ballast was intended to be lead, cast directly into the pockets in the keel. It proved to be impossible to obtain the required amount of lead. Hence about half the ballast is lead melted in place, and the remainder consists of rivet punchings well sealed with pitch. This combination may pose a question to the measurer under Cruising Club rules. Is it an iron keel with inside ballast or not?

Water and Gas Tanks

The fresh-water tanks are part of the ship's structure. There is one under each of the main cabin transoms, 45 gallons each. They are so connected that suction for the galley pump or the wash basin in the head may be taken from either tank, or they may be cross-connected at any time. The inside surfaces of these tanks were coated with zinc dust paint, which has stood up perfectly. Large bolted manhole plates provide for ready inspection and cleaning.

The 40-gallon gasoline tank is a separate cylindrical tank in the engine room, built of 1/8-in. mild steel, unlined. Since gasoline tanks fail most frequently from outside corrosion, the outside of this tank is well coated with asphaltum compound. Should any trouble develop, the tank can be taken out through the bulkhead door.



FROM THE COCKPIT, looking toward cabin. The exterior of the vessel is now well along to completion

NEITHER A WALL of cement blocks nor a long haul to the water kept the *Silhouette* from being launched

Steel construction makes it possible to subdivide the hull into compartments that actually are watertight. As an example, the bulkhead separating the galley and main cabin from the engine room is completely watertight from deck to keel. A hinged and dogged watertight door gives ready access to the engine. Separate suctions are provided for the bilge under the engine and that in the main cabin, although both lead to a manifold and common pump in the cockpit. Suction can be taken from either bilge, but there is no possibility of oily bilge water or fumes getting into the cabin.

The bulkhead separating the main cabin from the forward stateroom is likewise watertight from deck to keel. The doorway is designed to take a lightweight WT door, although I have not yet added this item. With the watertight door installed, the boat would be divided roughly into three equal compartments, watertight to the deck.

Chips Were a Nuisance

As previously stated, the hull seams and butts were chipped and ground flush after welding. This was not required on the deck since it was to be entirely wood covered; however, the doghouse is of light-gage steel and had to be properly finished. The entire exterior surface was then sandblasted and metal sprayed; we used pure aluminum below the water line and zinc above. Metal spraying was followed immediately by a brush coat of "Amercoat" primer and then several coats, sprayed, of the same vinyl plastic. The cementing was applied at the few spots before referred to, and the final finish was put on.

Inside, we were content with a thorough-going wire brushing. For this job, we used a power-driven rotary brush wherever we could. Power brushing was followed by the application of two liberal coats of a cold asphaltum emulsion on the shell. Bulkheads and other parts of the structure were given two coats of red lead.

In nearly every case where rust has shown up inside the boat, it has been found to be the result of drill chips not cleaned out after drilling a hole for some attachment. This is one of the difficulties in finishing a steel boat. You have to drill and sometimes tap for attachments, and it is even harder to get rid of the confounded chips. A good magnet is the only solution.

A few simple precautions were taken to avoid electrolysis. The propeller is bronze and the shaft Monel, but both are insulated from boat and engine. The bronze sea chests are also insulated from the shell.

With our fingers crossed, we used a single-wire system for the lighting, the boat's hull being the ground. The risk seemed justified since only 6 volts were involved. Not a trace of trouble has yet been found. The lighting system, however, isn't used too much when cruising. As a rule, the engine is not used enough to give any excess juice for spendthrift lighting. A gasoline lantern is a good shipmate, and in the months when it is an overly warm companion there isn't much need for lights. But it is a real pleasure to have electric lights located in every essential place for quick and brief use. When we dock, it's usually possible to find a source of 110-volt current somewhere within the range of the 150-ft shore connection cable we carry. Perhaps we'll get over our present dislike for a small generating set. It appears possible to make an installation that could be very nearly noiseless.

Cool, Quiet and Dry

Comfort aboard a small boat generally rests on three factors: keeping dry inside, being either warm or cool enough and a noise level low enough to be unnoticeable. The steel hull is without a peer as far as leakage is concerned. We did fear trouble from condensation and planned from the start to insulate and sheathe the cabin areas, from dresser or berth level up and under the deck. Below this level to the cabin sole, the shell was painted and dusted with granulated cork. Even in the relatively unfinished condition, however, we were all surprised by the lack of condensation or sound. Excellent ventilation probably has more to do with preventing condensation than does material, and the panel stiffening system used on the shell kills practically all metallic noise.

During the winter lay-up, the cabins were sheathed with hard-rolled thin aluminum sheets to which an inch of fiber glass was secured. Painted a soft ivory and secured by polished teak strips, these cabin panels add immeasurably to appearance and to comfort. The cabin is easily

heated in cool weather, and is as cool in summer as any boat's cabin I have ever visited.

Our original plan had been to use conventional hollow spruce masts. We changed our minds, however, and decided to go all the way with steel, using it for spars as well. The basic hexagonal form was used throughout, but we varied the diameter of the circle in which the hexagon was inscribed to obtain the proper sizes and tapers. Shearing and braking, together with simple low-capacity spot welders, were all the equipment required. Sections were generally 4 feet long, except for end pieces and those providing local reinforcement.

Stainless Mast Best

I must confess that *Silhouette's* present main mast is her second. The first was built when nothing but 19-gage mild-steel sheet was available. While this put the factor of safety against crippling in the mainmast into a region used only by adventurous airplane designers, we took the gamble. The 46½-foot spar weighed 158 pounds with all fittings and track (less stays and spreaders). Although this mast served during the first short season, enough localized crippling appeared to demand replacement. The present stainless-steel mast is 50% heavier and has three times the original fatigue strength. Both masts are stepped on deck, of course, since steel construction again makes it simple to transfer the compression stresses to the keel without affecting the arrangement below decks. Should a stay part or pull out the rig would simply go over the side and be cut clear. Incidentally the construction is watertight and the spars all have ample buoyancy to float. The stays are 1 by 19 airplane cable with zinc socketed end fittings.

Knocked Down the Wall

Throughout the building period, many a kibitzer gravely informed us that we had duplicated the famous boner of the man who built too large a boat in his cellar. Since the beam is a bit over 11 feet and the doors of the shop just 9 feet wide, there was some justification for the criticism. We had planned for it, however, and when the time came, we took down the door frame, and knocked out a few concrete blocks. Out she came, stopping traffic on a busy highway far from water, as spectators gathered.

Based on the building experience of *Silhouette*, there is little doubt that the bare hull of a roundbottom steel boat can be turned out in as few (probably less) man-hours than are needed for a well built wood boat. The appearance of the steel boat should satisfy the most exacting boat lover. The material cost would be considerably less. Vastly more sturdiness, lower maintenance and other advantages would be the extra dividends. However, the builder's costs (in our case, time) begin to go up in finishing up the steel hull. Somewhat more in finish inside is required, and it is harder to make the thousand and one attachments. The writer concludes that with all acceptable short cuts, the overall costs, boat for boat, would be about the same.

But as he contemplates freedom from caulking, dry rot and teredos (wood-gnawing worms), the writer thinks the steel hull is beyond cost comparisons. A difficult approach to a poorly protected commercial dock risks little beyond a scratch, and he doesn't need to worry about old fish stakes or taking a pounding in a bad blow. And there is no safer craft when lightning strikes. Peace of mind on all these counts really makes boating a pleasure!

Touch Each Base!

No. 2 in a series of inspirational talks on "Twelve Self-Assignments to Sales Success"

BY RICHARD C. BORDEN

In your desire to close a sale, you can be fairly compared to a batter in a ball park who would like to score a home run. You know what the chap at bat has to do. After smacking the ball a good, hard clout in the right fence-top direction, he has to run over to first and *touch* it. And, if he wants to score, he can't stop there.

He has to go on and touch second. Still he can't stop. Nor can he short-cut across the diamond to home.

He has to go still further on and touch *third*. Then, and then only, can he come in for a score.

Same way, essentially, with selling. You, too, in each sales presentation to a customer, must touch each base—must sink your selling spikes into each major point of your story.

If you fail to do that, for one reason or another—perhaps because you, yourself, have become bored with the repetitive retelling of your own selling points—then your penalty for base skipping is likely to prove the same as it proves in a ball park. No score!

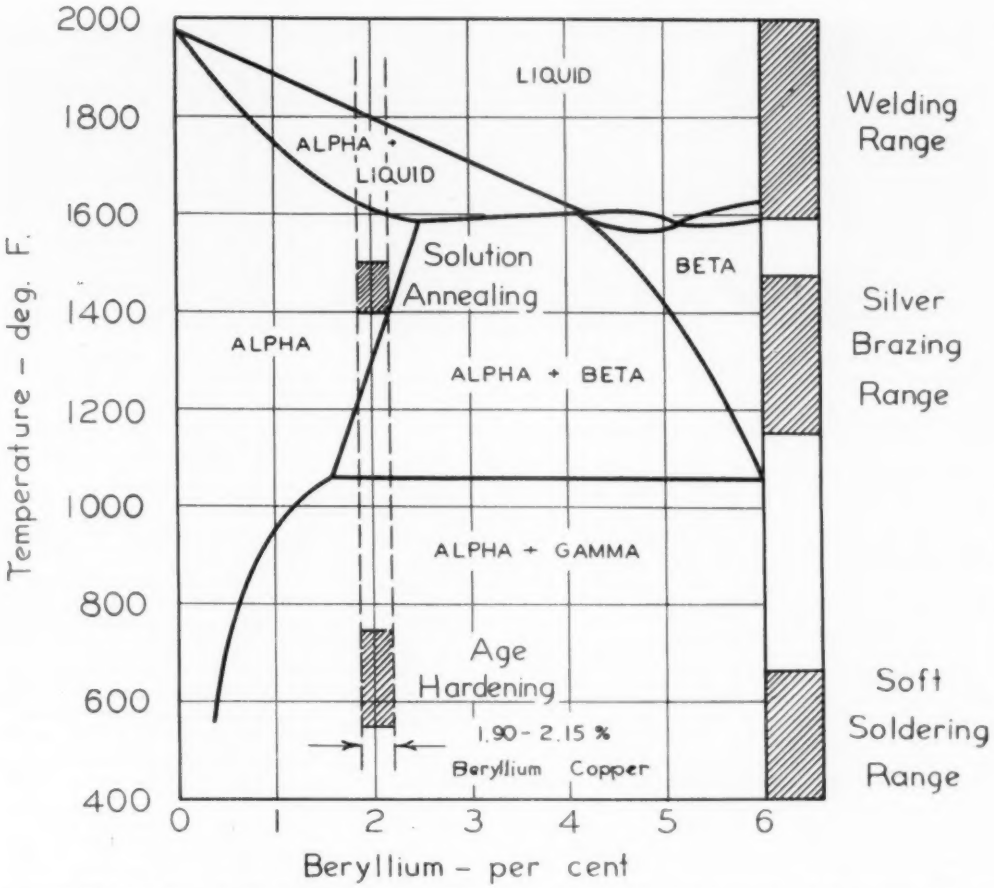
So beware *this* line of reasoning in advance of a sales interview:

"Since this guy I am going to talk to is a smart cookie, chances are he's already thoroughly familiar with most of my selling points. Maybe I'd only be boring him with stale old stuff if I gave him the complete treatment. Guess I'd better just hop-skip and high-spot through it."

Once you begin figuring that way, WATCH OUT . . . because unless you're careful, you may soon find yourself skipping bases on *all* your calls—little by little leaving out more and more of what makes customers WANT to buy. And, in so doing, you violate the first principle of good closing: TELL A STORY COMPLETE ENOUGH TO *JUSTIFY* A CLOSE!

This month, as your self-assignment, determine not to violate that principle. Put it to work on every sales call you make—whether formal or informal—whether short or long. TOUCH EACH BASE!

These articles, to be published one a month in The Welding Engineer, *are based on the script of a new Dartnell-Borden series of sales films called "Selling Against Resistance."*



1—COPPER-RICH END of the beryllium-copper equilibrium diagram. Note how the solution-annealing and aging ranges of the 2% alloy compare with the temperatures at right for soldering, silver brazing and welding ranges.

Welding, Brazing, Soldering

Beryllium Copper—I

Beryllium copper can be readily soldered, brazed or welded IF you take certain precautions. In joining, remember that—

1 Beryllium copper is an age-hardening alloy. Heating may affect its final properties.

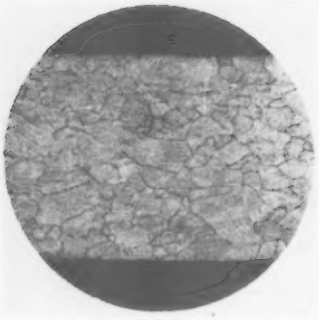
2 When this alloy is heated, a tenacious film of beryllium-oxide is formed. Unless you remove it, you will have difficulties.

BY JOHN T. RICHARDS

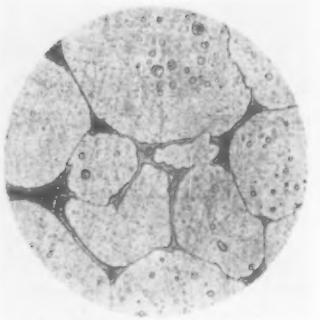
Design Engineer,
The Beryllium Corp., Reading, Pa.

(First of Three Parts)

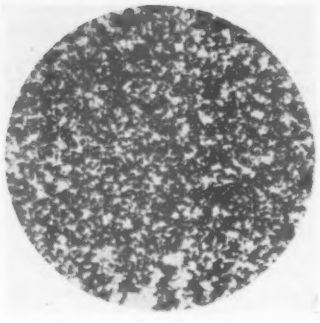
BERYLLIUM copper is characterized by its high strength and hardness, good electrical and heat conductivity, excellent resistance to fatigue, wear and corrosion. If you are after such properties, maybe a beryllium-copper part is the answer.



2—NORMAL structure of a strip solution-annealed and heat-treated



3—BURNED structure caused by heating at too high a temperature



4—STRUCTURE resulting from a prolonged heating at 1,100-1,350 F

Microstructures show what heat does to it!

This valuable alloy is finding increased use as a material for springs, diaphragms, bellows, small structural units and similar parts. It can be readily formed or machined in the soft (unhardened) condition, then hardened by a simple, low-temperature treatment to give the best combination of available properties.

It is frequently necessary to join beryllium-copper parts to similar or dissimilar metals. The design engineer may choose from a wide selection of methods: soft soldering, silver brazing, carbon-arc, metal-arc, inert-arc and resistance welding. No satisfactory process has yet been devised for brazing or gas fusion welding.

Composition and Properties

Let us now take a look at the standard alloy. It is available in two forms: wrought or cast. These have the following nominal compositions:

	Wrought	*Cast*
Beryllium	1.90-2.15%	1.90-2.15%
Cobalt	0.25	0.50
Copper	Balance	Balance

The difference, you will recognize, is solely a matter of cobalt. Typical physical constants, electrical and thermal properties for this alloy are given in Table I. Table II lists its average mechanical properties.

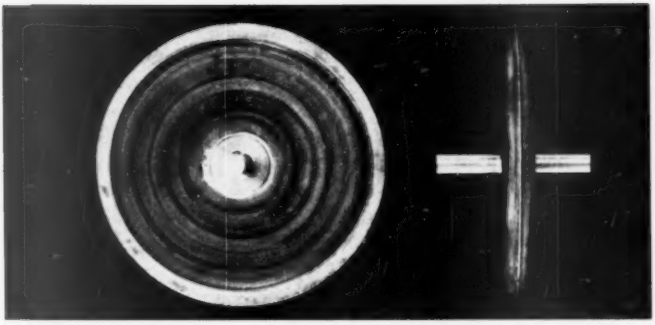
Both electrical and heat conductivity of beryllium copper are lower before heat treating: 16-20% compared to 22-30% after hardening. This means that it is generally advisable to silver braze or weld the metal in its unhardened condition. The relatively high heat conductivity of beryllium copper means special precautions must be taken in joining this alloy to steel, nickel, aluminum, bronze or other metals of lesser conductivity. Perhaps it may be necessary to preheat beryllium-copper parts to compensate for this effect. Similarly, some allowance should be made when parts of large and small cross-sections are joined.

Assemblies should be specifically designed for welding, brazing or soldering. You can't achieve either maximum economy or best performance if you just replace bolts or rivets with welded joints and let it go at that. For one thing, your joints should be made at points of low stress concentration whenever possible.

The two main things to keep in mind are listed in big type at the beginning of this article. To repeat, they are the effects of weld heat upon the age-hardening treatment and the tough film of beryllium oxide. Let's

Table I. Typical Physical Properties of Beryllium Copper

	Heat-Treatable	Heat-Treated
Miscellaneous Properties		
Specific gravity	8.21	8.25
Density—lb per cubic inch	0.296	0.298
Specific heat—cal per gm per °C (30-100 C)	0.10	0.10
Magnetic properties	Non-magnetic	Non-magnetic
Melting range—°F	1,585-1,750	1,585-1,750
°C	863- 955	863- 955
Maximum increase in density on heat-treatment, %	.....	0.6
Maximum decrease in length on heat-treatment, %	.....	0.2
Average Coefficient of Linear Expansion		
Per °C (20-100 C)	0.0000166	0.0000167
(20-200 C)	0.0000169	0.0000170
(20-300 C)	0.0000178	0.0000178
Per °F (68-212 F)	0.0000092	0.0000093
(68-392 F)	0.0000094	0.0000094
(68-572 F)	0.0000099	0.0000099
Elastic Modulus		
Tension, psi	17,000,000	19,000,000
Torsion, psi	6,600,000	7,300,000
Electrical Properties		
Conductivity, % I.A.C.S. (20 C)	15 -20	22 -29
Resistivity, microhm centimeters (20 C)	9.1-10.8	6.4- 7.2
(200 C)	10.9-12.7	7.9- 8.4
Temperature coefficient of resistivity (20-200 C)	0.0010	0.0011
Thermal Properties		
Btu/sq ft/in./hr/F (68 F)	470-620	790-870
(392 F)	580-720	940-980
Cal/sq cm/cm/sec/C (20 C)	0.16-0.21	0.27-0.30
(200 C)	0.20-0.25	0.33-0.34



Courtesy Battelle Memorial Institute

5—ANEROID CAPSULES formed by joining beryllium-copper diaphragms with lead-tin solder. Measuring button was also mounted with soft solder

look at each of these in greater detail.

Age-Hardening Response

The favorable properties available in beryllium copper are obtained through a two-step heat treatment. The material is first solution-annealed in the range 1,400-1,475 F, followed by a rapid quench. The second or aging treatment requires heat-hardening in the range 550-750 F. Generally, the first step or solution anneal is provided by the mill so fabricators need be concerned only with the low-temperature hardening treatment.

The beryllium-copper equilibrium diagram, Fig. 1, tells us that copper will dissolve about 2.1% beryllium at temperatures in the solution-annealing range; solubility decreases at lower temperatures. Rapid cooling (quenching) from a temperature within the field of maximum solubility will preserve the latter condition. Hence there may exist at room temperature a supersaturated solid solution with relatively high ductility and relatively low hardness, strength and conductivity.

Only about 0.25% beryllium is soluble in copper in the range 550-750 F. Aging at a temperature in this range will cause precipitation of the gamma phase from the unstable solution; results are an increase in hardness, strength and conductivity.

The ability of beryllium copper to respond to a treatment that doubles its strength and hardness offers certain fabricating advantages. The heat of welding operations permanently anneals (softens) most copper-base alloys, but with beryllium copper the maximum properties can be largely restored through aging.

It's also true that care must be exercised in the welding or brazing of beryllium copper in order not to destroy the hardness. Fig. 2, magnified 150X, shows the normal structure of a solution-annealed and heat-treated beryllium-copper strip. Fig. 3 shows a burned structure caused by heating the area at too high a temperature. Fig. 4 shows the structure resulting from prolonged heating in the 1,100-1,350 F range—about the temperature required for silver brazing.

Bear in mind that heating for any length of time in the range 750-1,400 F will produce structures which may not fully respond to aging, giving reduced final properties. The recommended joining procedures either allow only short heating cycles in the 750-1,400 F range or provide rapid cooling through these critical temperatures.

Fig. 1 reveals an interesting comparison between the heat treatments given to beryllium copper and the temperature ranges involved in soft soldering, silver brazing and welding.

Table II. Typical Mechanical Properties of Beryllium Copper

	Tensile Strength, psi	Elongation, % in 2 in.	Rockwell Hardness		
Strip					
Annealed	60- 80,000	35-50	45-65B	30T46 -60	15T75 -81.5
Annealed and heat-treated	165-185,000	5- 8	36-40C	30N56 -59.5	15N78.5-80.5
¼ hard	73- 88,000	10-30	66-85B	30T60.5-73.5	15T82 -88
¼ hard and heat-treated	175-190,000	3- 6	38-42C	30N57.5-61.5	15N79.5-81.5
½ hard	80-100,000	5-10	86-93B	30T74 -78	15T88.5-91
½ hard and heat-treated	185-200,000	2- 4	39-43C	30N58.5-62	15N80 -82
Hard	95-120,000	2- 4	94-99B	30T78.5-81.5	15T91.5-92.5
Hard and heat-treated	190-205,000	1- 2	40-44C	30N59.5-63	15N80.5-82.5
Rod and Bar					
Annealed	60- 85,000	35-50	55-80B	30T53 -68	
Annealed and heat-treated	165-185,000	3- 8	36-41C	30N56 -60.5	
Hard	80-120,000	10-25	80-97B	30T68 -80.5	
Hard and heat-treated	165-215,000	2- 6	36-44C	30N56 -63	
Wire					
Annealed	58- 78,000	35-50			
Annealed and heat-treated	165-180,000	2- 5			
¾ hard	110-140,000	1- 3			
¾ hard and heat-treated	185-230,000	1- 2			
Castings					
As-cast	70- 90,000	22-30	70-85B		
Cast and heat-treated	95-110,000	5-10	25-30C		
Cast and annealed	55- 65,000	30-40	55-65B		
Annealed and heat-treated	155-165,000	1- 5	38-44C		

Table III. Properties of Soft Solders

	Tin-Lead	Antimonial-Tin	Lead-Silver
Composition			
Tin	50	95	1.0
Lead	50	..	97.5
Antimony	..	5	..
Silver	..	..	1.5
Melting range, deg F	341-421	450-464	588
Electrical conductivity, %	11	12	9
Tensile strength—room temp	6,100	5,900	5,000
212 F	4,000	4,000	..
302 F	1,700	3,200	..
428 F	..	1,100	..
Shear strength	5,700	6,000	4,500
Izod impact strength, ft-lb	16	20	20

Table IV. Baths for Tin Plating

	Alkaline Sodium Stannate	Acid Stannous Sulfate
Composition, ounces per gallon		
Tin	5¼	4¾
Free caustic soda	1¾	...
Free sulfuric acid	...	8
Cresolsulfonic acid	...	13
Gelatin	...	¼
Beta napthal	...	⅛
Temperature, F	175	Room
Voltage	3-4.5	0.4-0.8
Cathode current density, amp/sq ft	10-25	10
Ratio of anode area to cathode area	1-1	1-1
Time required to deposit 0.001 in. (min. @ 15 amp/sq ft)	70-75	50

Soft soldering alone does not affect the heat-treated properties; it may be done after heat treatment. The other joining processes must precede hardening since they are carried out at higher temperatures.

Recommended Heat Treatments

The solution-annealing and hardening treatments generally used for beryllium copper are:

Solution-Annealing: 1 hour per inch or fraction of an inch of section thickness at 1,450 F, followed by an immediate water quench. This treatment can also be used to restore the heat-treatable characteristics of parts overheated in the range 750-1,400 F.

Hardening: 3 hours at 600 F, followed by uncontrolled cooling.

Beryllium-Oxide Film

Heat beryllium copper, and a thin film of beryllium oxide will be formed. This film is not easily reduced by the usual fluxes. Also, it is very refractory since its melting point is 4,650 F. The best way to deal with it is to prevent its formation whenever possible.

Scale formed during solution-annealing or hardening may be removed by pickling. The four stages are:

1. Immerse in a 20% sulfuric acid solution and heat to 150 F until the dark scale disappears.
2. Rinse in cold water.
3. Bright dip in 25% cold nitric acid solution for 15-30 seconds.
4. Rinse in hot water and dry.

You can also supplement pickling by use of steel wool, emery cloth, a scraper, file or grinder just before joining. Such mechanical cleaning will make sure that the surfaces are free from oil, grease or dirt as well as oxide film.

Soft Soldering

As we have seen from Fig. 1 soft soldering temperatures are below the aging range. This means that beryllium copper can be readily soft soldered after heat-treating without affecting its final properties. Drawbacks, however, are the relatively low strength of soft solder and its poor resistance to elevated temperature. If strength is required, lock-seamed, riveted or spot-welded joints should be used, with soft solder acting only as a sealing medium.

Where stresses are not high at the joint area, soft soldering may be used to advantage. Good results have been attained in joining beryllium-copper diaphragms in the production of aneroid capsules (Fig. 5). The two diaphragms are joined at the flanges (where stresses are low), and the solder serves principally as a means of sealing. Compared to silver brazing, soft soldering gives greater freedom from inelastic behavior (drift and hysteresis). This is probably because of the lesser heat the capsules receive in soft soldering.

Surfaces to be soldered must be absolutely clean and free from oxide or discoloration. If the surfaces are inaccessible for subsequent washing, the parts are frequently "pretinned" to insure bonding and good penetration by solder throughout the joint. The parts should be mechanically cleaned by steel wool, emery paper or wire brush before tinning. Once the surfaces have been tinned, however, they may be readily joined on any later occasion.

Types of Solders

Tin-lead (50% each), antimonial-tin (90% tin, 5% antimony) and lead-silver (97.5% lead, 1.5% silver, 1.0% tin) solders can be depended upon to give good results. The 50-50 tin-lead alloy is perhaps the most popular general-purpose solder; its usefulness, however, is limited to relatively low operating temperatures. The antimonial-tin and lead-silver solders offer increased resistance to elevated-temperature. Properties of all three solders are listed in Table III.

Theoretically, the thinner the layer of solder, the stronger the joint; in practice, however, thicknesses of 0.005 in. have been found to give the maximum strength. Thinner joints may suffer from flux inclusions and poor penetration, while thicker layers give decreased strength and dependability.

Soldering iron, gas-air torch or oxyacetylene torch heating can be used to apply the tin-lead and antimonial-tin alloys; lead-silver joining is limited to torch heating.

Types of Fluxes

Soldering fluxes may be broadly grouped as (1) corrosive or (2) non-corrosive. You won't want to use a corrosive flux if you can't wash the assembly after soldering. When the parts can be washed, however, an active flux such as zinc chloride is recommended because of its rapid and positive action.

A rosin flux must be used to prevent corrosion when the soldered parts cannot be washed inside and out. An example is the aneroid capsule shown in Fig. 5.

Straight zinc chloride has an optimum working temperature of 535 F. This may be higher than necessary for many joining operations; it can be reduced by adding ammonium chloride. Good results have also been obtained with a modified solder composed of zinc-tin-ammonium chloride plus free hydrochloric acid. The composition is:

Zinc chloride	25.0%
Ammonium chloride	2.5
Stannous or stannic chloride	2.5
Hydrochloric acid	2.5
Wetting agent	0.1
Water	Balance

To prevent subsequent corrosion, all traces of the flux should be removed. Rinse the soldered parts immediately and thoroughly in hot water.

A rosin-in-alcohol flux is non-corrosive. It can be satisfactorily employed if (*a*) the surfaces are absolutely clean or (*b*) the part has been previously tinned. Watch the heat, however, since rosin will char at relatively low temperatures. Additions of lactic or oleic acid increase the activity of rosin flux, but these fluxes are more corrosive than straight rosin and are not recommended for use in closed assemblies such as capsules. Typical compositions include:

(1)	Rosin	25%
	Lactic acid	5
	Methyl alcohol	Balance
(2)	Rosin	25%
	Oleic acid	5
	Methyl alcohol	Balance

All of the fluxes I've discussed are available as proprietary fluxes under various trade names.

How to Pretin

Pretin wherever possible as it assists in attaining sound joints. Parts can be tinned with the soldering iron, with the torch, by hot-tinning or by tin plating, using either pure tin or solder of the same composition as that employed for the final joining operation.

In soldering with the antimonial-tin alloy (95-05) the parts *must* be pretinned with this solder or with pure tin in order not to decrease the elevated-temperature strength through the addition of lead. A minimum surface area of elastic components (springs, diaphragms, etc.) should be tinned; plating introduces excessive inelastic behavior as can be measured by drift and hysteresis.

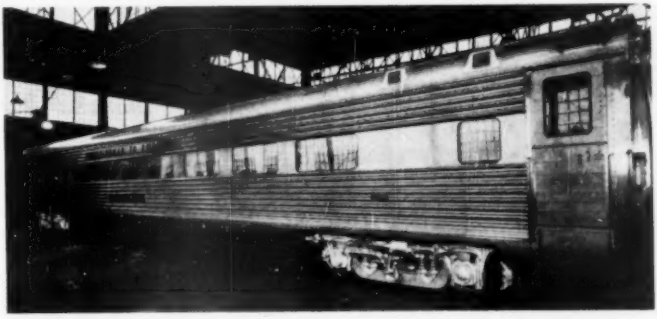
To pretin by soldering iron or torch, the joint area is first covered by a light coating of solder or tin with the aid of a strong chloride flux. The tinned parts should be carefully washed to remove all traces of flux. Now the tinned components can be readily joined with the aid of a rosin-in-alcohol flux (non-corrosive).

Hot-tin dipping is done in conjunction with a chloride flux. Beryllium copper can be pretinned by this method provided the surface is clean. Coatings average 0.0008 in.

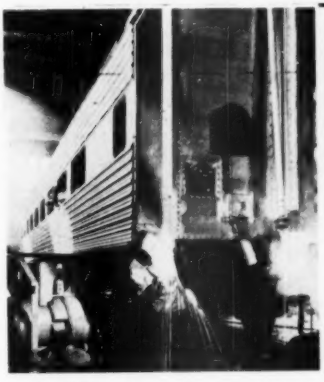
If production warrants, plating baths may be used. The alkaline sodium stannate bath is recommended if facilities permit operation at 175 F; at room temperature, use the acid stannous sulfate bath. The recommended minimum thickness of the preliminary tin coating for soldering is 0.0003-0.0005 in. Suggested procedures are given in Table IV.

Next month, Mr. Richards will discuss the joining of beryllium-copper parts by silver brazing, brazing, gas fusion and resistance welding. His third and final article will cover the welding of beryllium copper by the carbon-arc, metal-arc and inert-arc processes.—The Editors.

More Power to America Special



MPA SPECIAL will carry a giant traveling exhibit of 2,000 electrical products



WELDORS at Pullman-Standard Car Mfg. Co., Worcester, Mass., work on the nine stainless-steel cars. Arc welders will be among products exhibited

First train of its kind in industrial history, the General Electric Apparatus Department's "More Power to America Special" began its nation-wide tour of key cities this spring. Its nine shining stainless-steel exhibit cars will display everything in electrical apparatus from precise aircraft instruments to complex operating systems for steel mills. Welding equipment is also there. Admission is by invitation only.

REGISTRATION DAY! Attendance was good—better than any previous convention of National Welding Supply Ass'n. Interest was good, too

CONTACT BOOTHS were one of the most popular features of the 1950 convention

NWSA Report

Bob Mars, NWSA president, opens sixth convention

GOOD SPEAKERS, good interest and good fellowship all helped to make the sixth annual convention of the National Welding Supply Association an outstanding success. This year's convention, held May 8-10 at the Hotel LaSalle, Chicago, had a total registration of 202 members and guests—an increase of around 25% from last year.

During the convention, the association gained seven new members, bringing its total membership to 175 welding distributors and interested manufacturers.

A most welcome innovation was the "contact booth" program held during the first two afternoons of the three-day meeting. It is to be hoped that "contact boothing" will be made a permanent feature of NWSA conventions. Manufacturers especially liked the idea since it gave them many valuable distributor contacts without the expense of an elaborate formal exhibit. Said one manufacturer: "It would take thousands of hours of travel and cost hundreds of dollars to see all the dealers I've seen here."

MONDAY SESSION

President Robert S. Mars, of W. P. and R. S. Mars Co., Duluth, Minn., called the convention to order at 10:00 a.m. Monday, May 8. He asked active members, associate members and guests to all stand and introduce themselves. Then Secretary Robert C. Fernley reported on the activities of the past year. Among other accomplishments, he mentioned:

A report giving the breakdown of overhead expenses of distributor members. This is the first such report ever compiled on a national scale for welding distributors.

A report summarizing the methods used by 56 distributors to compensate their salesmen.

A study of the types of sales assistance that distributors desire from manufacturers' salesmen.

Traditional at most conventions is the annual address of the retiring president. President Mars lifted his address out of the commonplace by a happy inspiration. He turned from distributor into historian and looked back upon the happenings of the past half-century that have affected and formed our present economic system. Conclusion to be drawn from this historical review is that our economic heritage is basically strong and will weather whatever storms may be before it. Mars warned, however, that we must temper our optimism with a touch of conservatism.

Another excellent speaker followed: R. P. Melius, vice-president, power tool division, Rockwell Mfg. Co., Milwaukee. "Do you sell them—or do they just buy?" Mr. Melius wanted to know. A welding distributor, he reminded his listeners, is as much in the retail business as a Walgreen drugstore. His advice: treat each customer as if he were a $50 bill walking into the store—that's what it costs to secure him.

Mr. Melius recommended investment in a good movie projector to assist selling and stressed the value of demonstrations and clinics. He said that ledger cards should be treasured and analyzed frequently. "Above all," he concluded, "study your customer's needs so that you can honestly say that you sell him and that he doesn't just buy."

COSTS SWALLOWING PROFITS

The third speaker, A. M. Morris, publisher of THE WELDING ENGINEER and of *Industrial Distribution*, gave a straight-from-the-shoulder talk on

what the distributor is up against today. He cited the case of an actual distributor, who is an efficient operator and modern in all respects:

"In 1940, his dollar sales volume was some $650,000. In round figures, his margin was 25%, and his cost of operations 18% of sales. His operating profit was 7% of dollar sales. . . . In 1948, his dollar sales volume was some $1,600,000 or two and a half times that at 1940. His margin was almost the same, but his cost of operations rose to 19% of sales. So he made some 6% on dollar sales.

"His cost of doing business, however, increased nearly *two and two thirds times* while he was increasing his business—at 1940 prices—by 65%. To complete the picture, his business in 1949 fell off approximately 12%—that 12% drop in dollar sales volume cost him almost 40% in operating profits. Where in heaven's name will he be if his volume drops any more?"

Mr. Morris was of the opinion that distributors are depending too much on "brand names" to do their selling. "In fact, some use brand names as their *only* reason for being in business. They have been, and are, neglecting the job of selling themselves, selling the services they offer and selling *why* it pays to buy from them. . . . If the distributor has little else than the coat tails of well known manufacturers' names to carry him into the plants in his territory, why bother about all this service that is supposed to be the basis of his function? Brand names are important, but a distributor has much more to sell."

New Officers and Directors

A revision of by-laws to provide for direct election of the president and other officers, instead of selecting them at a board of directors' meeting, was proposed by Advisory Secretary Thomas A. Fernley, Jr. The revised by-laws, adopted by unanimous vote, also abolish the office of senior vice-president.

Ralph E. Chase, of Chase Welding Supply Co., Benton, Ill., was named chairman of the association's first nominating committee. The committee's slate was elected by unanimous vote. The new officers are:

President: Glenn G. Garman, vice-president and treasurer, Purity Cylinder Gases, Inc., Grand Rapids, Mich.

Six regional vice-presidents: R. S. McCracken, Jr., R. S. McCracken & Sons, Inc., Philadelphia (eastern district); G. Milton Sims, proprietor, Absco Welding Supplies, Los Angeles (western district); W. A. Rice, president, Virginia Welding Supply Co., Charlestown, West Va. (southeastern district); William F. Johnson, president, Johnson Welding Equipment Co., Chicago (central district); Walter G. Lofgren, president, United States Welding Works, Denver, Colo. (west central district); Charles O. Stilwell, partner, Gulf Welding Equipment Co., New Orleans (southwestern district).

Directors: Elmer Bakke, president, Welders Supply Co., Inc., Seattle (short term to replace the senior vice-president on the board); Homer W. Cessna, owner, Cessna Welding Supply Co., Baton Rouge, La.; Gordon Duff, president, Gordon Duff, Los Angeles; R. R. Tarbell, president, Scott-Tarbell, Inc., Cleveland; R. P. Mahoney, partner, Albany Welding Supply Co., Albany, N. Y.

Tuesday Session

Practically all distributors interviewed by your reporter were in accord that the best talk given on Tuesday morning was that of C. I. MacGuffie, manager of sales, welding divisions, General Electric Co., Fitchburg, Mass. The arc-welding branch of the industry alone, said MacGuffie, has now become a $70,000,000 a year industry and the market is constantly being increased by new applications of welding. Some distributors, however, fail to live up to their opportunities.

One of these fringe types is the order taker. He goes all the way out to sell himself to the manufacturers whose lines he handles but that apparently exhausts his salesmanship. At this point, the speaker switched on a tape recording to allow his audience to listen in on an order taker at the telephone, while he lost a potential big order by reason of his lethargy and lack of imagination.

A second type of non-desirable dealer is the continual griper. He complains about the product and about his discount—about everything, in fact, but himself. Again, the tape recording was used to bring the whines of the chronic griper into the room.

Fortunately, these and other fringe types, such as the sloppy Joe whose place of business looks like a very unattractive cold storage warehouse, are well on their way out, thinks MacGuffie.

It's to be regretted that there isn't space to outline the talks of the other two speakers: Robert J. Bayer, editor, of *Traffic World*, and George W. Cloos, economist, Federal Reserve Bank, Chicago. Nor can we do more than mention the annual banquet on Tuesday night—a truly enjoyable affair. Those who were there will never forget the baffling "eyeless vision" feats of blindfolded Dr. Harlan Tarbell. With his eyes sealed with adhesive tape, Dr. Tarbell can see better than most men with eyes open.

Wednesday Session

The down-to-earth, brass-tacks part of the convention was crowded into Wednesday forenoon. Since the five talks given were all by active distributors, on subjects requested by other distributors, it's a pity that more time was not allotted to them. Each talk aroused a lively discussion, which had to be choked off in order to get through with the heavy program. Your reporter respectfully suggests that there is enough talent among distributor members—and certainly enough live ideas—to justify them two full days on the next convention program.

First speaker, Joseph A. Cunningham, president, J. A. Cunningham Equipment, Inc., Philadelphia, discussed the advantages of an inventory control system. He suggested that customers' names instead of invoice numbers be put on the inventory cards as an abbreviated name takes up no more space than a number and it gives much more information when the cards are analyzed.

Charles O. Stilwell, Gulf Welding Equipment Co., New Orleans, talked on the training and selection of salesmen. He stressed that a good man needs no more money for living expenses than a mediocre man during the training period, so it pays to hire thoroughbreds instead of jackasses.

R. C. Waldie, Williams and Co., Inc., Pittsburgh, told why his firm requires sales reports, who must see them, how they are routed and what

(Continued on page 31)

Defects in Stainless-Steel Spot Welds

BY PAUL F. DUVALL, ROBERT S. SMITH AND FRANK E. CRAIG
Engineering Department, Special Products Division, I-T-E Circuit Breaker Co., Philadelphia

- **When you are spot welding stainless steel, quality must be maintained at a high level to meet the requirements that today's many critical applications impose.**
- **Are you going to have special set-up men establish the machine settings? That may not always be practicable. If you are going to leave settings up to the operator, then you will have to provide him with help.**
- **How much and what sort of aid should you give him? Three resistance-welding specialists tell what I-T-E Circuit Breaker Company's Special Products Division has found acceptable. Before you start to read this article, we suggest that you turn to page 49 and examine the Weld Defect Chart appearing as Engineering Data Sheet No. 117.**

SPOT-WELDING equipment is provided with means for accurately controlling the tip force, the magnitude of the current and time of current flow. Let us assume that the proper engineering practices are used in selecting the material, designing the parts for welding and preparing their surfaces. The principal reason why quality welds are or are not produced then boils down to the ability of the operator to develop the proper machine settings.

That's what this article is about. The discussion will be limited to the spot welding of stainless steel since this is a specialty of the Special Products Division of I-T-E Circuit Breaker Co.

Quick Weld Set-ups

You can do one of two things. First, you can employ set-up men to establish machine settings for long production runs and use relatively unskilled operators to do the production welding. This plan can result in savings. It may prove impractical, however, to follow it if your company produces a relatively few products, each having a great many spot-welded parts. In such a case, you would probably save production time if you had the individual operators establish their own settings. The latter procedure places the major responsibility on the operator and local inspector; it necessitates well trained, high-grade personnel.

Obviously, the number two procedure can be made profitable only if the operator can develop his set-ups quickly. The less time he spends on set-ups, the more time available for production welding. A premium is, therefore, placed on speed in establishing machine settings. Our engineering department encourages the operator to use a logical, systematic approach in attacking the problem of establishing machine settings for good-quality welds. We give him everything that we can think of to help him develop set-ups in the least possible time.

One of the things that we do is to provide the operator with standard charts that show tip force, number of cycles of current flow, tip diameter and dressing requirements. We have developed these charts for different thicknesses and types of sheet stock. You can't put everything on paper, however. The charts serve only as a guide to give the operator a start in the right direction. He himself is responsible for establishing the current (heat) setting required to produce a weld nugget of the proper size and quality.

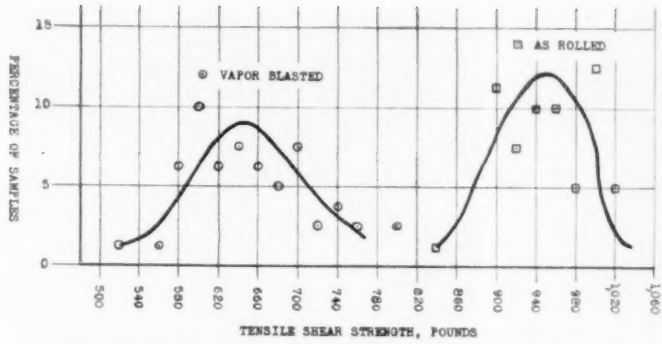
Sometimes the set-up does not fall within the standard chart. In that case, we provide the operator with a special set-up card that lists all the necessary settings and special requirements, as developed by our resistance-welding laboratory. Again, the current or "heat" setting is excepted.

To develop a set-up, the operator welds test coupons. He determines the quality of the nugget by using (1) a tension-shear test and (2) a cross-section macroscopic etch. Both are necessary to insure the specified strength and a defect-free nugget of acceptable penetration. In some cases, it may be necessary to weld actual production parts instead of test coupons for destructive testing.

Both tension-shear and macroscopic etched specimens should be used in interpreting the quality of spot welding. It is possible to get acceptable strength and yet have a defective weld nugget that should be rejected. The key to successful weld set-ups is in the ability of the operator to recognize the defects that may be present in a nugget. Our operators know how to section the weld through the center of the nugget and etch the surface so that they can examine the structure for defects such as cracks, blowholes, lack of penetration, voids, etc. They also know how to make corrections in their machine settings to eliminate all of the defects while maintaining weld strength.

Weld Defect Chart

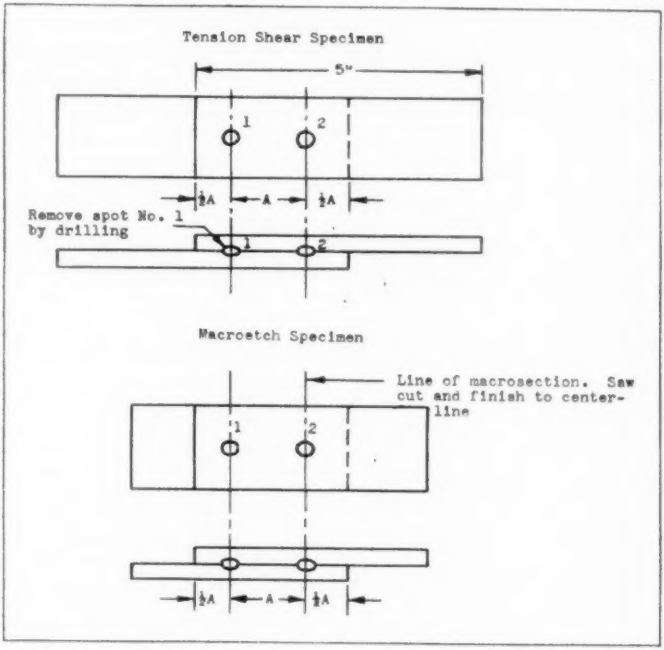
We developed the Weld Defect Chart (Engineering Data Sheet, page



1—PROBABILITY CURVES for specimens in 0.031-in. type 310 stainless sheets. Compare shear strengths of vapor-blasted and as-rolled conditions

Table I. Tensile Shear Strengths, Lb

	Minimum	*Maximum*	*Average*
Vapor blasted	520	800	649
As rolled	840	1,020	958


Tension Shear Specimen
5"
Remove spot No. 1 by drilling
Macroetch Specimen
Line of macrosection. Saw cut and finish to center-line

2—CURRENT SHUNTING effects are determined from tension-shear and macroetch specimens above. These are tested when spots are close-spaced

49) to help the operator to understand the causes of weld defects. It pictures typical defects found in the spot welding of austenitic stainless steels and lists their causes in the order of their importance. This chart supplies a logical order for the adjustment of machine settings to eliminate defects. At the top of the chart is shown the ideal weld nugget the operator should attempt to develop. Below, various causes of defects appear in order of their relative importance. If the operator changes the welding variables in the order 1, 2, 3, 4, etc., that will usually be the fastest way for him to arrive at the ideal nugget. The chart is not intended as a cure-all, nor do we wish it to stereotype the work of the operator. There may be instances where the order of attack will have to be changed. What the chart does do is to make the operator think about what is occurring in a weld. For this reason, it's especially valuable in training new men. While the chart is limited to two thicknesses, the basic thoughts behind it can be used to develop settings for pile-ups of more than two sheets.

We maintain quality control by requiring two satisfactory tension-shear specimens and one satisfactory cross-section macroscopic etched specimen. These must be approved by the inspector before the start of production welding, also at stated intervals during the production run. Standards for approval are governed by the general specification on spot welding and by the requirements of the standard weld chart or special set-up card, whichever may be applicable.

What Operators Can't Help

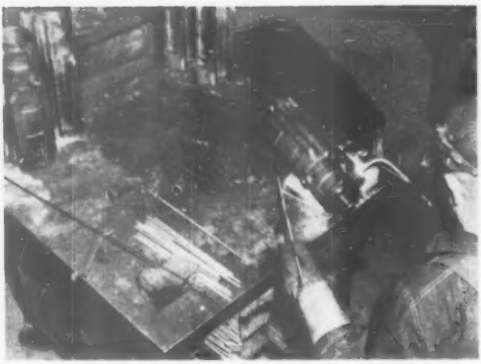
In the spot welding of stainless steels, there are many variables not under the control of the operator. Some of these are the selection of the type of material to be welded, its surface preparation, pile-up, spot spacing, width of flanges and laps. All of these are determined before the operator sees the job. Let's look at some of them.

The type of stainless steel is usually specified and selected for its special corrosion-resistant and/or high-temperature properties. Occasionally, the material presents welding difficulties because of the condition known as crack sensitivity. When an operator encounters this condition, he should submit the material to the laboratory for the development of special weld set-ups. The same is true of pile-ups of more than three thicknesses and narrow flange and lap conditions.

To return to the case of crack sensitive stainless steels, an increase

(*Continued on page 35*)

1—ROCK DRILL cylinders go into the Gardner-Denver welding department to be hard-faced along their ways



2—WELDOR DEPOSITS an alloy on each end of both pairs of recessed ways on the barrel of the cylinder

Production Hard-facing

Modern mining wouldn't be possible without blast holes, and such holes couldn't be drilled without rock drills. Gardner-Denver Co. uses both welding and hard-facing to give miners a better drill

BY GERALD ELDRIDGE STEDMAN

(Photos by Marge Stedman)

THIS ARTICLE is on the welding techniques at the Denver plant of the Gardner-Denver Co. Before I go into details, though, you might like to know more about Gardner-Denver and what it makes.

Out in the mountain state of Colorado, mining is a big-time industry. But mining can't be done without drills to chew holes in the tough rock for the insertion of dynamite. If there are any readers of this article who lived in Denver 25 years ago, they will recall the old Denver Rock Drill Mfg. Co. It was one of the city's leading industries.

Two Leaders Merge

In 1927, Denver Rock Drill merged with the Gardner Governor Co., of Quincy, Ill. Gardner Governor had an even longer history than Denver Rock Drill, dating back to the pre-Civil War year of 1859. The result of the combine was the present Gardner-Denver Co., a big-league outfit with plants not only at Denver and Quincy but also at LaGrange, Mo., and at the far-distant mining center of Johannesburg, South Africa. In addition, the company has 43 branch offices.

Besides rock drills and accessories, Gardner-Denver manufactures other air tools including air hoists and air motors, mine car loaders, air compressors (both water and air cooled), pumps (centrifugal, dry vacuum and duplex types), governors and oil-field equipment.

The company is known for the alertness of its engineering departments. This engineering foresight has resulted in the introduction of a number of important new products. Among these, I would like to mention: a small portable air compressor unit for intermittent service in such jobs as bridge repair, paint spraying, stone tipping and monument carving; several sizes of self-priming pumps for irrigation, contracting and industrial use; a new 650-hp pump for deep drilling and exploration work in oil fields; a line oiler for pneumatic machinery (it automatically cuts off the supply of air to the pneumatic tool or tools when the supply of lubricating oil is exhausted); a small paving breaker for demolition and reconstruction requirements; a line of air-driven motors for saw mill rigs in the lumber mill industry; important improvements in the mounting of air motors and rock drills.

The Denver plant represents my 1,088th plant visit since 1942. I am indebted to Works Manager G. E. Lucking and Superintendent Stanley Mittick, to Metallurgist F. R. Anderson and Weld Foreman Ed Kerls for the information upon which this article is based.

The Gardner-Denver shop has good housekeeping. Its supervisional ratio is one to 13. Last year it increased its receiving and raw material storage, added a new 118 by 150 ft manufacturing addition devoted to the heavy tools—boring, milling, planing—involved in its mucker (loader) manufacturing and assembly. The company makes much use of progressive dies, automatic machining, palletized material movement. Its production departments are on an incentive basis, and it has pleasant union labor relations with CIO and AFL (office).

Many of the Gardner-Denver products require pressure-tight performance, necessitating special welding techniques. Parts that have to be hard are generally welded in the soft condition and then flame-hardened or carburized. Gardner-Denver makes extensive use of flame-hardening. It

3—CYLINDERS ARE preheated in furnace (right) and maintained at preheat temperature during hard-facing

4—WELDING GROOVE around plug on a valve used in an air motor. Preheating prevents weld from cracking

# of Rock Drills

uses arc, oxyacetylene and inert-arc welding in a great variety of production welding applications.

Hard-facing Drill Cylinders

There are some 1,827 parts that receive production welding. In Fig. 1, we see rock drill cylinders going into the company's welding department for hard-facing. Foreman Ed Kerls (right man in the picture) is discussing production details with Weldor James W. Trott. The department has 11 weldors. Standard instruction cards are required on all jobs.

The first job we witnessed was the hard-facing of the ends of the ways of the rock drill cylinders (Figs. 2 and 3). The cylinder is a steel forging; the ways slide in an aluminum guide shell. Since a rock drill pounds at the rock until the steel wears itself out, the whole tool must be designed to withstand enormous impact. To increase the wear resistance of its cylinder ways, Gardner-Denver deposits overlays of a cobalt-chromium-tungsten alloy onto each end of both ways.

A recess is milled in each end to prepare the ways for the overlay. The idea is to apply the alloy in amounts that are just enough but not too much. It is deposited by oxyacetylene welding in a 1/16-in. build-up that is later ground flush.

The particular cobalt-chromium-tungsten alloy used runs like water, and the proper technique is to keep it controlled. If the alloy runs into the corner, an extra grinding operation is required. A skilled weldor can save a lot of grinding.

The procedure is complicated and takes many operations. Weldors are given these detailed instructions:

The cylinder is taken from a tote box and set in a fixture to weld. The piece is preheated in nearby furnace (Fig. 3), and the top side of the first end is hard-faced. The piece is turned and set to weld, preheated again and the opposite side of the first end is hard-faced. The piece is turned over and set to weld, preheated and hard-faced on the bottom and opposite side of the first end. It is turned over again and set to weld. The edge of the first end is hard-faced. The piece is turned over, and second edge is hard-faced. The piece is then stood up on end while the ends of two ways of the first end are hard-faced.

Now the piece is laid on the bench to weld the smooth-up beads on the two top sides of the first end. The piece is turned for the smooth-up of the two bottom sides of the first end. It is turned again, and the first edge of the first end is smoothed up; turned once more and the second edge of the first end is smoothed up. It is then stood on end for smooth-up of the ends of the two ways.

The piece is given another preheat, and the top side of the second end is hard-faced. The piece is then turned, set to weld, preheated and the opposite end is hard-faced. It is turned over and set to weld, preheated and the bottom end is hard-faced, followed by the opposite end of the bottom. Then, as in the first weld manipulation, the piece is turned over, set to weld and the edges of the second end are hard-faced with their corresponding smoothing-up welding operations. Lastly, a 5/32-in. hole is weld closed before the piece goes from bench to tote box.

The hard-facing alloy is not affected by subsequent hardening operations.

Closing the Port Holes

Twelve port holes must be closed by welding in plugs. This is done by ordinary metal-arc welding with E-7010 electrodes. To be plugged are 11/32-in. holes on the sides, angle holes on the bottom at the front end and a 1/4-in. hole on the large end of the cylinder. These holes are for the lifting and trip ports of the drill. After the exterior holes have been welded, the interior holes can cause the needed air travel. The welds must be sound, free from cracks, absolutely leakproof. The work is inspected for leaks by 100-psi air and given a magnetic-particle inspection if necessary.

The detailed instructions for the

5—DRUMS FOR a mine slusher are made by welding together two halves: one cast steel and one a forging

6—TACKING a spacer plate on a dipper arm. Welding booth is served by a swing hoist, is fully exhausted

7—AUTOMATIC FLAME-CUTTING of stacked plates: single-torch machine uses a track-template follower

8—DRILL JIG positioner for the plant's own use is clamped in cross slots of rotating table for welding

welding of these twelve port holes are:

Take six pieces from the tote box and place on the weld bench, large end up. Insert plugs in the large end of each cylinder to protect the inside from spatter. Weld the three countersunk holes of the large end with 1/8-in. E-7010 electrodes for the first pass. Change to 5/32-in. electrodes and weld two 5/8-in. countersunk and one 1/4-in. holes of the large end (first pass). Make the above welds in all six pieces before going to the next pass. Clean slag and finish weld holes at the large end. The second pass is made with 3/16-in. electrodes. Clean slag and touch up if necessary.

Remove plugs and lay cylinders on bench. Turn each piece end for end (small end up) and weld one hole on small end with 1/8-in. electrodes for the first pass. Clean slag and set to weld; weld one hole, second pass, in small end with 1/8-in. electrodes.

Lay pieces on side and set to weld. Weld first holes on side, first pass, 3/16-in. electrodes. Clean slag and weld first hole on side, second pass, 3/16-in. electrodes. Weld second hole on side, first bead, 3/16-in. electrodes. Clean slag and set to weld; weld second hole on side, second pass, 3/16-in. electrodes. Tip as necessary and set to weld.

Weld large countersunk hole on side, first pass, 3/16-in. electrodes. Clean slag and set to weld; weld countersunk hole on side, second pass, 3/16-in. electrodes. Clean slag and touch up if necessary.

Turn bottom side up and set to weld; weld angle hole on bottom side with 5/32-in. electrodes. Turn over and weld large countersunk hole second side, first pass, with 3/16-in. electrodes. Clean slag and weld second pass with 3/16-in. electrodes. Clean slag and touch up if necessary. Remove cylinders from bench and place them in the tote box.

Carburizing Practice

After all welding is done, the rock drill cylinders are hardened by carburizing. Weld strength values of around 100,000 psi must be attained at the finish.

The Gardner-Denver practice of carburizing in a vertical gas furnace is distinctive. The furnace is 36 in. in diameter by 48 in. deep. The carburizing time is eight hours. The work is loaded on specially designed trees or racks. At discharge, a rack is suspended above the vertical furnace and unloaded by a crew with shovels. The work is carried to a nearby oil quench. It is then delivered to a batch-type convection furnace to be drawn at 350 F for one

hour. Barrel tumbling with shot removes the outside scale.

Dissimilar Drum Halves

The Gardner-Denver weld technique for production welding of drums involves the mating of two halves: one a steel casting and the other a steel forging. The forging is selectively carburized and hardened. Fig. 5 shows the welding of the two halves to make one of the double drums of a mine slusher (scraper). The drum provides a roller-type engagement, constituting a bearing race for a roller-type clutch on the slusher hoist. The inner race of the drum takes six rollers (using cam action) and must have a hardness of 61-63 Rockwell C.

The trick is to accurately position the two dissimilar halves for welding. It's done in a special fixture. The two drum halves are held in two chucks by three-finger holds and rotated for continuous downhand welding. Five passes are made with 3/16-in. lime-coated (low hydrogen) electrodes. A 300-amp welder is used, and the welding time is one hour.

Fig. 4 shows another tricky welding job: welding the groove around a plug on a distributor valve in an air motor. Again, preheating is used to prevent cracking.

As an example of another type of work, Fig. 6 shows the arc tacking of a spacer plate on a dipper arm. Production of such equipment as dipper buckets and mine car loaders requires plates to be shape-cut. Fig. 7 illustrates automatic flame-cutting of stacked plates with a machine using a track-template follower. Stacks or single plates up to 2½ in. thick may be shape-cut with this machine, either using a track-template or by following the outline of a drawing manually. Before welding, most of these plates are shaped in forging dies.

Gardner-Denver uses welded construction in its own fixtures. In Fig. 8, a welded drill jig positioner is being fabricated. A positioner is needed to make a positioner, the work being clamped in the cross slots of a fully rotating table. Many other positioners are purchased from outside, including a large one for underbody fabrication of the mine car loader.

There is much welding of tubing in frame fabrication. An example is the carriage that holds and handles rock drills. It is suspended from a tractor boom in trenching for pipe lines. The tubular framework for the heavy-duty rock drill is welded in special positioners whose frames are also welded products.

Considerable welding is already being done by the inert-arc process. After a year, the shop is still experimenting. So far, experience indicates that the process works well on high-carbon steel and aluminum, but the operator must know what he is doing. I noticed the equipment being used for closing the ports on a gear-case cover for a rock drill feed.

The company saves a great deal of cleaning time by using a proprietary edge varnish. The weld area is painted by brush with this varnish, and 95% of the slag is easily removed by wire brush after welding. The varnish also shields and masks against weld spatter and so saves considerable grinding time.

DEFECTS IN SPOT WELDS

(*Continued from page 31*)

in heating time will usually have a beneficial effect on the quality of the weld nugget. The longer heating time, however, may have possible influence on carbide precipitation, electrode life and surface appearance. All of these factors will have to be considered. The longer heating cycle may encourage greater electrode indentation; then adjustments of pressure and electrode radius may be necessary. The effect of the longer current time on electrode life may have to be counterbalanced by longer "off" periods.

Surface Preparation

Surface preparation is important as it affects both weld strength and weld consistency. Commercial finishes of stainless steel are usually satisfactory for spot welding, but the surfaces must be free of all grease, paint, scale and foreign matter. However, if the material has been sand-blasted or vapor blasted, special set-ups may be needed. A typical example of this is shown by Fig. 1.

Fig. 1 gives probabilty curves for spot-welded tensile shear strengths in AMS 5521 (AISI type 310) stainless steel, 0.031 in. thick. The tensile-shear strengths of 50 samples each of vapor blasted and "as-rolled" material are plotted. The ordinate gives the percentage of the sample and the abscissa or X-axis the tensile-shear strength in psi. Minimum, maximum and average values are given in Table I.

In this instance, the welding variables were established on "as-rolled" material and the same machine settings were used to weld the vapor-blasted material. You can see how strength went down. By making a special set-up on vapor-blasted material, we raised the average pull value from 649 to 877 lb. While this is still less than the average value obtained for spot welds in as-rolled material, it does show the value of making a special set-up if the production parts have been vapor-blasted before welding.

Current Shunting

Close spot spacing may allow some of the current to shunt through the weld just completed instead of helping to make a new weld. The result is loss of heat in the second weld. You can usually compensate for the condition by increasing the heat setting after the first weld. We require the production weldor to submit to the inspector the tension-shear specimen and the macroetch specimen shown in Fig. 2.

In these drawings, "A" equals the pitch of production welds. Spot No. 1 is removed by drilling from the tension-shear specimen to make sure that spot No. 2 passes the minimum standards for strength. It must also pass the minimum standard for nugget diameter, as determined by the macroetch specimen.

To summarize, it is the operator's responsibility to use all of the welding aids we provide him. There is no point in giving him controls that time the duration or the welding current flow to fractions of a second, or the amount of welding force to a few pounds, if he does not use the equipment properly. The chart shown in this month's Engineering Data Sheet was prepared to aid the operator in arriving at the best quality weld in the shortest possible time. But everything can't be left up to the operator. Consideration must be given to the factors over which he has little or no control if consistency of quality is to be maintained. Technical or laboratory men should study these factors.

CONFERENCE BIGWIGS! Left to right are J. R. North, F. W. Rowe, A. Magagna, Myron Zucker and R. Gardner (AIEE headquarters)

INSTRUMENTATION SESSION personnel. Left to right are: N. P. Millar, Ralph Sherman, Alex Sherman, G. I. F. Theriault (session secretary), R. C. McMaster (chairman), W. F. Savage, C. B. Stadum

2nd Electric

Practical engineers and long-haired physicists both contributed to the big three-day meeting at Rackham Memorial, Detroit, held under sponsorship of American Institute of Electrical Engineers

BY CLYDE B. CLASON

"IT REALLY IS a darn good meeting!" That about expresses the sentiments of most of the over 400 designers, manufacturers, research scientists and practical operating men attending the second AIEE Conference on Electric Welding. This notable event was held April 5, 6 and 7 at the Rackham Memorial building, Detroit, under sponsorship of the American Institute of Electrical Engineers in coöperation with the American Welding Society and the Industrial Electrical Egineers' Society of Detroit.

The six tightly packed sessions covered virtually everything new in electric welding from basic research into the nature of the electric arc to problems of power supply for resistance welders. A-c arc welder controls, submerged-melt welding, stud welding, glass welding, high-frequency induction welding, instruments and equiment for resistance welders were among the many subjects discussed. Several of the products described in conference papers were also exhibited in action at two evening demonstration sessions.

The conference opened at 9:30 a.m., Wednesday, April 5, with an address of welcome by J. R. North, chief electrical engineer, Commonwealth Associates, Inc., Jackson, Mich. Mr. North, a former director and the present vice-presidential nominee of AIEE, paid tribute to the men who had worked to make the second conference possible. Myron Zucker, of Myron Zucker Engineering Co., Royal Oak, Mich., also had a few words to say in his official capacity as chairman of the AIEE national committee on electric welding.

Basic Arc Research

Dr. L. P. Winsor, Rensselaer Polytechnic Institute, Troy, N. Y., served as chairman of the initial session on arc research. R. C. Freeman, General Electric Co., Pittsburgh, acted as session secretary.

Keynote of this basic research session was sounded early by the first speaker, Dr. Wolfgang Finkelnburg, Engineer Research and Development Laboratories, Fort Belvoir, Va.: "There is nothing so good as a team formed by physicists (long-haired or not) and the engineer with his amazing skill." Dr. Finkelnburg, whose subject was the physical mechanism of low- and high-current arcs and their relation to the welding arc, dismissed the welding arc as being one of the most complicated that we know of and went on to electric arcs in general. The mechanism of electric arcs, he said, depends on the interaction of the three main parts of the discharge: the cathode drop, the anode drop and the arc stream. A satisfactory theory of the electron emission from the cathode spot of metal arcs is still missing. The cathode fall does not seem to depend to any great extent on the arc current. The arc stream, on the other hand, undergoes a considerable change if the current is increased from 80 to beyond 100 amp. This transition to the high-current arc stream is of great importance for the welding arc, declared the speaker. He described a new way of measuring what is happening in the arc stream by means of a rotating metal probe.

D. H. COREY (left), chairman of demonstration committee, and R. C. Freeman, a session secretary, have just got their badges

MOST POPULAR innovation at this second conference was the two evening demonstrations sponsored by the Detroit section of the American Welding Society. Twenty-four companies staged exhibits

Welding Conference

New Inert-Arc Electrodes

Dr. J. D. Cobine, General Electric Co., presented a paper written by him and C. J. Gallagher, also of G-E, on new electrodes for stabilizing inert-gas welding arcs. Slow starts with cold tungsten electrodes may lead to irregularities in welding, said Dr. Cobine. It is possible to do away with this by using other electrodes than pure tungsten. These new electrodes are intended primarily for straight-polarity welding. Two forms have been developed. One consists of a pure tungsten rod coated with either zirconia or thoria and a suitable binder. The other consists of a mixture of tungsten and thoria powder extruded into rods and sintered. The presence of the refractory oxide—zirconia or thoria—makes it possible to get a stable spot. On application of high-frequency ignition voltage, the arc is immediately established on the tip of the electrode. About cold-cathode arcs in general, Dr. Cobine contended, a great many words have been used to conceal ignorance.

Dr. T. B. Jones, of Johns Hopkins University, Baltimore, described a research undertaken by him and Merrill Skolnik to determine the fundamental electrical properties of the d-c arc by enclosing electrodes of high melting point in an atmosphere of inert gas (argon). Both the anode and the cathode were ¼-in. tungsten rods—one movable and one stationary. The chamber in which they were enclosed was evacuated down to a pressure of 1 micron before argon was admitted, evacuated again down to 1 micron pressure and argon admitted for the second time and allowed to build up to full atmospheric pressure. When the electrodes were fairly close together, the arc structure was dominated by a "flame" or discharge emanating from the cathode. This was supplemented by an "anode flame" as the separation increased to between 0.3 and 0.4 in. As the separation increased to about ½ in., the whole arc became dominated by the anode flame. High-speed movies, taken at 1,000 frames per second, showed how the arc changed from cathodic to anodic structure as the electrodes were gradually forced apart.

G. K. Willecke, of the physics department of Lawrence College and consulting engineer of the Miller Electric Mfg. Co., both of Appleton, Wis., described a photographic and spectrographic study he had made of the inert-gas-shielded arc. The workpiece was a 1-in. aluminum plate, and the electrode a ⅛ in. wolfram (tungsten) electrode.

Arc-Welding Equipment

In contrast to the morning's rarified atmosphere of pure science, the Wednesday afternoon session was by and for practical engineers. J. H. Blankenbuehler, Hobart Brothers Co., Troy O., served as chairman, and Ray Freeman, of General Electric, again acted as session secretary.

S. Oestreicher, chief engineer, welder and motor division, Harnischfeger Corp., Milwaukee, described a new a-c arc welder that uses a saturable reactor for output control. This purely electrical arrangement provides current control without the use of any moving parts. The reactor, in series with the transformer secondary, has two coils fed by rectified d-c. The more d-c allowed to pass through these coils, the more usable welding current. With this system, remote control is no more than an extension and a couple of plugs. A constant air gap of 50 mils helps to produce a properly shaped wave for welding.

An entirely different way of controlling a-c welders was described by G. K. Willecke (also on the morning program), who presented a paper

written in collaboration with A. C. Mulder, plant manager of the Miller Electric Mfg. Co., Appleton, Wis. Willecke and Mulder went back to the moving-coil type of welding transformer and tried to do away with its ordinary limitation of slow current adjustment. Their solution was to use a totally enclosed oil hydraulic system, driven by a ½-hp reversing motor. To avoid starts and stops, the motor is always running but is bypassed until the operator presses a button. There are but two buttons to press: one moves the coil up and the other down. Coil travel halts instantly at the desired current level as soon as the operator takes his finger from the button.

Mr. Willecke admitted that this method of welder control was not made to sell cheaply. However, he did not think that it could be beat where ideal welding characteristics are required, particularly in inert-gas welding and for automatic applications.

George R. Wagner, electrical engineer, Bureau of Ships, Washington, D. C., described the welding-machine characteristics that the Navy holds most desirable in securing the most satisfactory arc-welding performance. A fourth paper, on the welding characteristics of the mechanical rectifier-type arc welder, was scheduled but not given because of the absence of its author, K. L. Hansen, consulting engineer of Milwaukee. Mr. Hansen's paper will, however, be included with the others in the bound volume of conference proceedings to be published by the American Institute of Electrical Engineers. All conference discussions, questions and answers will likewise be included in the bound volume, available at $3.50 per copy from AIEE headquarters in New York City.

Special Welding Processes

Stud welding, induction welding and submerged-melt welding all got their innings at the Thursday morning session. E. M. Guyer, Corning Glass Works, Corning, N. Y., was chairman, and E. F. Steinert, Westinghouse Electric Corp., Buffalo, secretary.

G. W. Garman, of General Electric Co., opened the session with a brief but interesting talk on the importance of resistance-welding controls to the automotive industry. He said that one quarter of the cost of a new tooling program for car manufacture is represented by resistance welding. Furthermore, a car would cost anywhere from $500 to $1,000 more if it were not for the savings effected by resistance welding. One large automotive company now has over 1,000 electronic controls for its resistance welders and expects to increase that number by 50% next year. Welding speeds as high as 300 to 400 spots per minute are being achieved.

R. C. Singleton, manager, customer engineering division, Nelson Stud Welding, division of Morton Gregory Corp., Lorain, O., described the arc stud-welding process. Among recent improvements, he cited a new serrated type of ferrule to surround and shield the arc. Experiments are being made with power sources other than the standard welding machines customarily employed, he said. Some laboratory machines have been built to take advantage of the low duty cycle and other special characteristics of the stud-welding process. Experiments have also been made with twelve 6-volt batteries connected in series. Using a battery power source, it is possible to weld studs up to ½ in. in diameter. Two problems still being worked upon are the problem of exact stud location and the problem of the fillet formed when the stud is plunged into the pool of molten metal. With regard to the location problem, tolerances of ±0.015-0.020 in. can be achieved by the use of a tube adapter on the end of the stud-welding gun. With templates or center-punch location, tolerances to be expected are on the order of ±1/32 in.

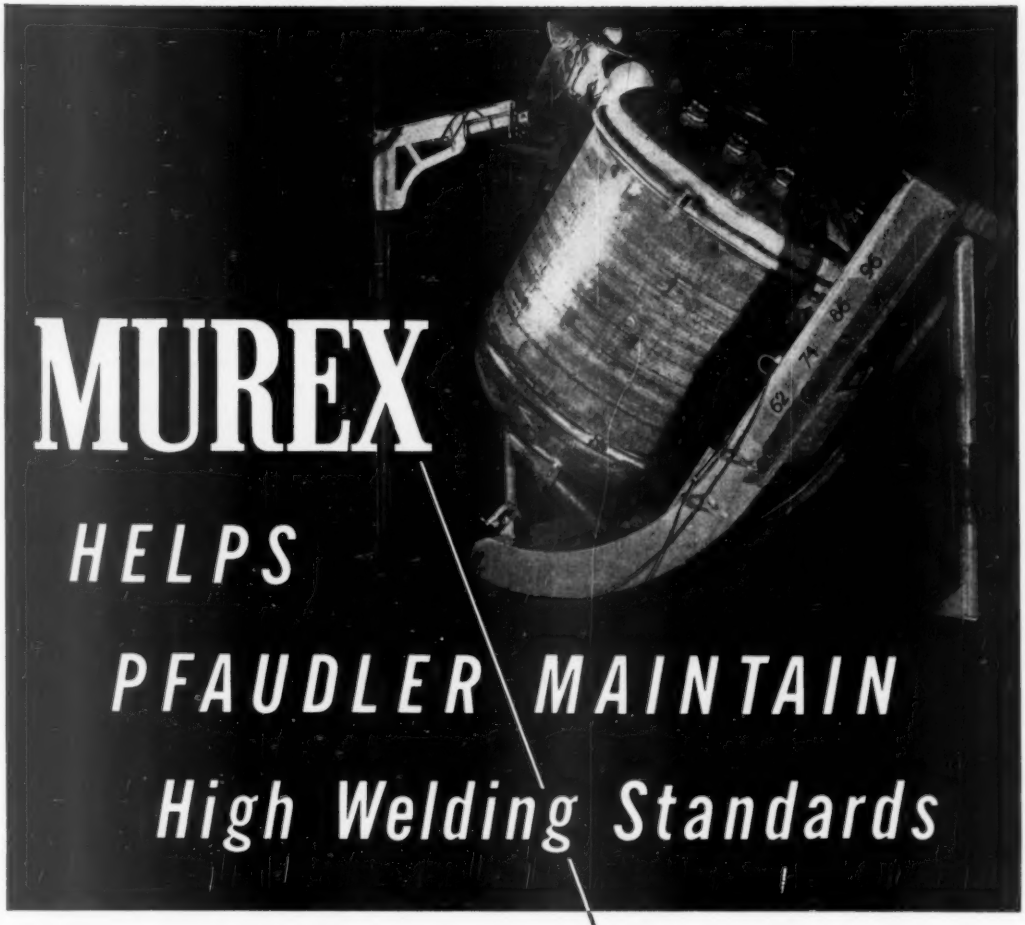
J. A. Kratz, The Linde Air Products Co., New York City, told about methods of voltage control for submerged-melt welding. There are three types of such controls: electronic, series and air-operated. All of them operate on the feedback principle and make use of voltage variations to regulate the speed of the rod feed motor. Submerged-melt equipment is now capable of handling currents up to 4,000 amp and welding rod up to ½-in. diameter, declared Mr. Kratz.

R. J. Bondley, General Electric Co., Schenectady, covered the subject of high-frequency induction welding. He said that it had found its greatest application in products too large for spot welding but too small for seam welding. Practical limits on diameters of workpieces were given as 3 in. for stainless steel and 2 in. for mild steel. An interesting variant of the high frequency process is to set a bell jar over the coil and make the welds in a controlled atmosphere (argon, helium, hydrogen, etc.) or in a vacuum. Timing can be controlled very accurately by using synchronous timers of the same type used for spot welding. The heat induced by the high-frequency current is always on the surface of the workpiece; below the surface, the heat decreases in inverse proportion to the square of the distance from the surface. Since only a few hundredths of a second are required to make a weld, the parts are not subject to any distortion. Disadvantages of the process are that it is limited to ferrous metals and that shapes other than round are difficult to handle.

Glass Welded Electrically

Dr. M. R. Shaw, Corning Glass Works, Corning, N. Y., revealed some very interesting information as to how the hard, heat-resisting borosilicate glasses are being welded by electrical means. Because of the intricate shapes (such as a television tube) demanded by modern industry, it is no longer possible to produce many complete glass products by simple blowing. Only the component parts can be produced in this way, and these must then be joined by welding.

The electric welding methods available for glass are the dielectric loss heating method, induction heating and resistance heating. The third type, resistance heating, has been found to be the most practicable. The electrical resistivity of glass, enormous at room temperatures, decreases rapidly as the temperature rises until in the range from 500-1,000 C (932-1,832 F) it becomes possible to heat glass electrically. To bring the joint to the required elevated range, the starting-coat method is sometimes employed. A semiconductive coating such as graphite is painted on the surface of the glass, and gaps in this coating are then scratched with a stylus. As current is applied, small arcs form across the gaps in the coating. The resultant heat cause the coating to burn away, increasing the arc path and



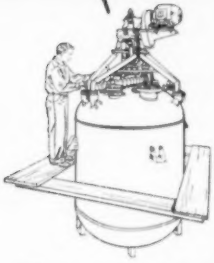
MUREX

HELPS PFAUDLER MAINTAIN High Welding Standards

MUREX
ELECTRODES

METAL & THERMIT CORPORATION
100 EAST 42nd STREET • NEW YORK 17, N. Y.

Newark
Philadelphia
Pittsburgh
Cleveland
E. Chicago, Ind.
Minneapolis
So. San Francisco



Murex Type FHP Electrodes play an important role in maintaining the high standards of welding set by The Pfaudler Co., manufacturers of glass lined and alloy processing equipment. This outstanding downhand electrode deposits weld metal of superior quality, and, at the same time is fast and easy to use.

Leading fabricators in many industries standardize on Murex — either to obtain better welding, or to achieve more economical production. Investigate Murex performance. Write for descriptive literature.

creating still more heat. Finally, the glass reaches the temperature at which its electrical properties are suited to resistance heating.

Another method of preheating is to use oxyhydrogen flames. A very large piece may be set up in a lathe and revolved above the heating head. When the glass reaches a dull-red heat, it is possible to promote the flow of electricity through it. This is done by sending the current through the oxyhydrogen flames, which act as brushes.

High-frequency glass welding requires a 60-cycle power source, a high-voltage transformer (20,000 volts), a spark gap and a radio-frequency transformer. Dielectric loss heating uses frequencies up to 3,000 megacycles; induction heating frequencies up to 100 megacycles. The greatest application of high-frequency glass welding, said Dr. Shaw, is in manual jobs such as the field welding of glass piping.

All of the types of joints known in metal welding can also be made in glass: butt joints, fillets and T-joints, for example. Large glass objects must be heated in a furnace while they are being welded in order to avoid heat stresses.

R-W Instrumentation

Dr. Robert C. McMaster, Battelle Memorial Institute, Columbus, O., acted as chairman of the instrumentation session on Thursday afternoon. G. I. F. Theriault, Frigidaire Corp., Dayton, O., served as session secretary. In opening the session, Dr. McMaster deplored the fact that the field of resistance welding was still basically uninstrumented. Because instruments to assure accurate watch over welding variables are lacking, a heavy expense is laid upon industry in the rather burdensome specifications established for quality control.

A good start toward securing the basic instruments needed was made at this session. The first paper, by C. B. Stadum, Westinghouse Electric Corp., Buffalo, presented information on means for measuring the true secondary current in three-phase and single-phase low-frequency converter systems. The two means available to measure the secondary current directly are the shunt and the feed-through current transformer. The shunt is the simpler to apply but gives a larger error than the current transformer. Still another way is to estimate the secondary current by measuring the primary current. Although this is an approximate method, it can often be used to great advantage and is comparatively simple to use. Mr. Stadum presented equations for approximating the secondary current when the primary current or the ignitron tube currents are known.

Warren F. Savage, department of metallurgy, Rensselaer Polytechnic Institute, traveled from Troy, N. Y., to present information gathered in a flash-welding research he had undertaken with Dr. Ernest F. Nippes, also of the Rensselaer department of metallurgy. The instrumentation described by Mr. Savage was developed to aid in evaluating the effect of flashing variables on the production of flash welds in commercial aluminum alloys. The Savage-Nippes team used oscillographic methods of measuring current and employed an empirical relationship to permit convenient calculation of the rms value of flashing current from oscillographic traces. Other variables they measured were the platen travel during the flash-welding cycle, the forging force during upset, the instantaneous power during the welding cycle, the average power during the flashing cycle and the instantaneous temperature at three positions back of the final weld interface.

Another co-authored paper was by N. P. Millar and A. A. Kavaliauskas, General Electric Co., Lynn, Mass., on the new I^2T indicator for resistance welding. This was presented by Mr. Millar. The measuring unit introduced—the ampere-squared-second—combines amperage and time into a single variable. The new instrument makes use of two bimetal helixes mounted on one shaft in a manner to produce torque opposition. Because of its comparatively low cost, this new device offers the possibility of being placed upon every resistance-welding machine. It is not, however, the first I^2T indicator to be invented.

Dean W. B. Kouwenhoven and W. T. Sackett, Jr., school of engineering, Johns Hopkins University, investigated the problem of non-uniform current flow in contact resistance. When two surfaces are brought together, actual metal-to-metal contact generally occurs only at small subareas of the apparent contact area, declared Dean Kouwenhoven. The resulting contact resistance consists of two factors: a contact resistance "proper" and the spreading resistance due to the non-uniform current flow in the material. The paper described an experimental evaluation of the spreading resistance as a function of the area in actual contact.

"It keeps the mosquitos away!"

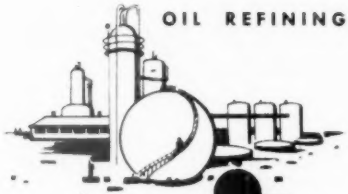
A Resistance Indicator

Not scheduled on the program was a surprise paper by Ralph and Alex Sherman, of the Sherman Electric Co., Inc., Warren, O. This father-and-son team has invented a device for the direct reading of resistances as they change from instant to instant. The Sherman invention can be applied anywhere that resistance measurements are important—welding or otherwise. Basically, it incorporates a ratio device, a cross-coil movement, to indicate the resistance in microhms directly as a ratio of voltage over current. The cross-coil movement consists of two coils, rigidly mounted to each other and moving in the field of a permanent magnet. Also mounted on these two coils is an instrument needle. One coil is fed by the voltage drop occurring across the point whose resistance is to be measured; it produces a torque in the proportion of the voltage changes, moving the needle to the right side.

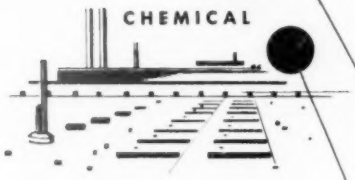
The second coil is fed by a very small amount of current proportionate to the current flowing through the line. The number two coil produces a torque proportional to the

AGRICULTURE

OIL REFINING

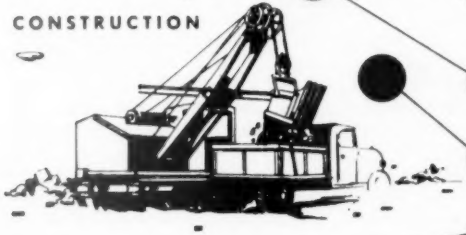


CHEMICAL

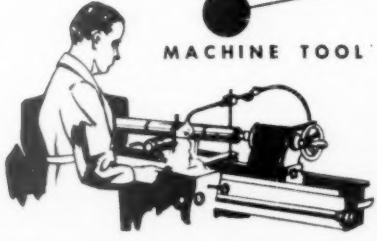


CEMENT

CONSTRUCTION



MACHINE TOOL



"Colmonoy"* SERVES ALL "Industry"

* ● Machinery is used in almost all phases of industry. This machinery is constantly subject to wear—wear is costly in time as well as money. Whether this deterioration is from friction, abrasion, corrosion, impact or excessive heat, COLMONOY HARD FACING ALLOYS will increase the life of these machines 3 to 28 times. Below are listed a few typical examples of actual case histories.

REPORTS FROM—

1. **Agriculture . . .**
   Plow shares treated with **Colmonoy** sweat-on paste hold their edges and last up to 17 times longer.
2. **Oil Refineries . . .**
   Pump parts **spraywelded with Colmonoy No. 6** give 600% more service even when operating in Caustic or Sulphuric.
3. **Chemical Plants . . .**
   Valves, operating in even the most corrosive mineral acids, last 5 times longer when protected with **Colmonoy No. 5 rod.**
4. **Cement Industry . . .**
   Mill hammers faced with **Colmonoy No. 1** crush 300% more rock.
5. **Construction Companies . . .**
   Shovel teeth built up with **Colmonoy No. 1** reduces maintenance cost over 70%
6. **Machine Tool Operators . . .**
   Colmonoy center tip castings soldered on new or worn centers wear from 7 to 10 times longer.

Order from your local jobber.
Complete engineering data on request—

WALL COLMONOY CORP.

HARD FACING ALLOYS

19345 JOHN R • DETROIT 3, MICH.

magnitude of the current and acts toward the left. At a certain position of the coils, an equilibrium exists between both forces that corresponds to the ratio of E÷I—the resistance to be measured.

For welding applications, the Sherman instrument can be used to discover:

(*a*) The resistance of a weld,

(*b*) Resistance between the dies and the welding specimen, and,

(*c*) The resistance of any permanent connection.

At important applications, suggests Alex Sherman, it is preferable to have independent instruments for the weld and for each die because the resistance change here is very fast and might be very different with each welding specimen.

Resistance-Welding Equipment

The third morning of the conference was given over to resistance-welding equipment. W. G. Bostwick, Precision Welder and Machine Co., Cincinnati, acted as chairman of this important session, while C. B. Stadum, Westinghouse Electric Corp., Buffalo, served as secretary.

Dean L. Knight, National Electric Welding Machines Co., Bay City, Mich., discussed the design of transformers for resistance welding. Though present AIEE-RWMA standards for transformer ratings can be improved, he asserted, they certainly have gone a long way in eliminating the confusion that existed before the standards were adopted. Some of his other conclusions were:

(1) Transformer impedance is much more important to transformer design than transformer efficiency.

(2) Transformer efficiency is not too important a consideration. More important is welder efficiency—secondary amperes vs. kva input.

A valuable production tool to metal fabrication is the multitransformer welding press. This was discussed by Jack Ogden, Fisher Body Div. of General Motors Corp., Detroit. It is common practice, he said, to tie such welding presses into a continuous-flow stamping press line, using mechanical handling equipment to permit automatic and semi-automatic transfer, loading and unloading of weld assemblies. Interchangeable components on these special-purpose machines will minimize obsolescence and cut the cost of model changes. To meet the problem of high power requirements, groups of transformers on a given machine may be "stagger-fired." Presses may be pneumatically, hydraulically or electro-mechanically driven. The welding transformers must be readily interchangeable, compact and designed for low-duty-cycle, high-current loads. Secondary circuits may be of the series, direct or "over and under" types, the se-

(*Please turn to page 56*)

Aluminum Studs Successfully Welded to Aluminum Plate

London (*McGraw-Hill World News*): A new application of stud-welding and proof of its successful use in joining aluminum to aluminum have been disclosed by Cyc-Arc Ltd., Stelmar House, 27 New North Road, London.

Aluminum studs are now being welded to the aluminum-alloy plates forming the deckhouses and superstructures of a new class of Royal Navy destroyers (eight in all), which are under construction for the British Admiralty at several British shipyards. The studs serve to secure the expanded-metal reinforcement that forms an important part of the "Newall" process of spraying asbestos insulation onto these structures to prevent condensation.

The Admiralty, after witnessing a number of trials of the stud-welding method under shipyard conditions, has also approved the process for application on a number of other ships of various types being built.

Here's how the studs fit into the whole insulation procedure:

First, the bulkheads, sides and underdecks of the aluminum-alloy superstructures that are to be insulated have the studs attached at about 7-in. spacing throughout the area to be covered. Then the specially prepared asbestos fibres are mixed with water and sprayed on from a gun to the required thickness—about ½ in. in this case. This asbestos coating is supported in place by spreading over it the expanded-metal reinforcement, which is then firmly secured by bending over the projecting portion of the studs. A thin coating of asbestos cement composition is then applied over the expanded metal to leave a smooth, hard surface.

Cyc-Arc Ltd. has only recently perfected the technique of welding aluminum-alloy studs to aluminum-alloy plate. No great change is involved from the already established equipment and methods for steel and brass studs.

The British company demonstrated to the satisfaction of the Admiralty that its standard equipment, without any additional accessories and without the use of an inert-gas shield, could do the job successfully. Your correspondent has also seen the welding take place and has been convinced that the result fully measures up to the company's claims.

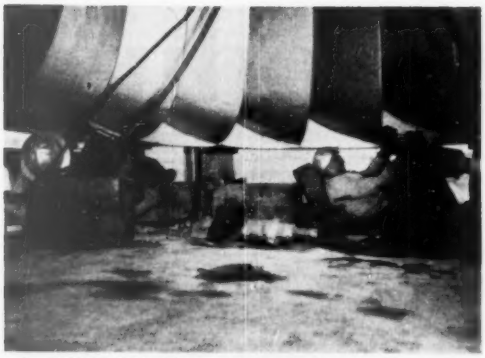
Both commercially pure (99%) aluminum studs and 2½%-magnesium alloy studs have been successfully attached to No. 7 S.W.G. aluminum-alloy plate (of specification AW6-half hard).

A slotted stud ¼-in. in diameter was approved by the Admiralty. Studs of ½-in. diameter were also satisfactorily attached by the same equipment.

Ultimate tensile strength of the welded attachment is about 11½ tons per sq. in. Shear strength of the joint is approximately 80% of this figure.

The welding was done under shipyard conditions and required only one additional stage over the method required for stud welding of steel to steel: a small amount of cleaning of the surface at the point of attachment. This was done to remove the zinc-chromate primer normally applied to both sides of the aluminum plate and thus insure a satisfactory electrical contact.

A small ceramic ferrule was used to surround the stud at the moment of welding. With steel, such ferrules are normally required in Britain only when welding studs of greater diameter than ½ in. downhand or when the welding is being done overhead or vertically.



1—CHISELING old metal from buckets' trailing edges

2—METAL REMOVED by the chisel and sanding wheel

3—NEW WEARING surface of 19-9 stainless is added

4—SANDED SMOOTH, welded inlay is ready for work

Inlays Welded on Old Turbine

A face-lifting job at a Washington water power project shows the way to counter excessive pitting on the trailing edges of turbine runner buckets

A FACE-LIFTING job with stainless steel preserved an old turbine runner from the scrap heap and permitted it to be used with a new 45,000-kw generator. Result: a new power unit added to the Pacific Power & Light Company's Merwin hydroelectric project (on the Lewis river in southwestern Washington) at a greatly decreased cost.

The runner is the revolving part of a water turbine—the part that carries the buckets. Whirling around at terrific speed under the action of water at high pressure, it is subject to continuous erosion and abrasion.

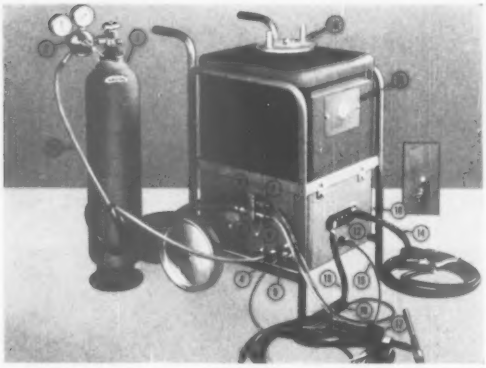
The old runner had been in service since September, 1931. Over the 18-year period, water action had drilled countless tiny pits in the trailing edges of the runner buckets. The remedy? Surgery to cut out the faulty sections and replace them with new metal. The surgeon's tools were the pneumatic chisel, the portable grinder, the arc welder and a good supply of stainless-steel electrodes.

Machinists for Morrison-Knudson Co., general contractor on the generator installation, took on the job under direction of J. P. Murray, erecting superintendent for S. Morgan Smith Co., maker of the original water wheel. Their task was to alter the buckets of the nearly-old-enough-to-vote runner to the company's latest design.

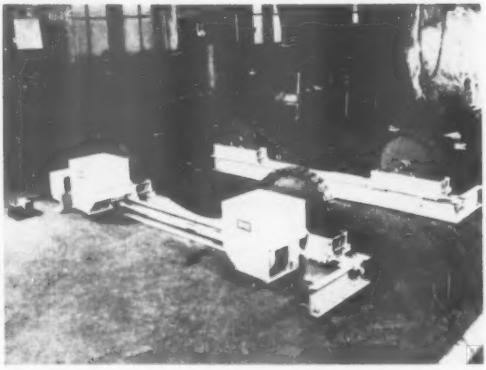
First, the entrance edges of the buckets were streamlined by cutting away the excess metal with pneumatic chisels. A disc sander took off the chisel marks and left a mirror surface. Then a triangular section was chiseled from the trailing edge of each bucket. The men had to work in cramped quarters to do this job, lying flat on their backs under the runner (Fig. 1).

A layer of metal ⅛-in. deep was chiseled from the trailing edge of each bucket (Fig. 2). Then the new metal was added to provide a fresh wearing surface—185 lb of 19-9 stainless were deposited upon each cutout (Fig. 3.) Sanding of the welded inlay (Fig. 4) completed the conversion job.

New products



REMOTE control button on holder shuts off gas flow and h-f current in new inert-arc welder. Welder can also be used for spot-arc



TRACK-TYPE turning roll protects light gage tanks. Copper grounds can replace certain shoes. Rolls handle 10 ft diam tanks

New A-C Inert Arc Welder Welds Stainless, Aluminum

HIGH performance at comparatively low cost is claimed for the new Kern a-c inert-arc welding line. Heart of the design is the patented dual-type welding transformer. According to the manufacturer, this gives a smooth, steady arc, maximum heat output through entire welding range and a low open-circuit voltage.

Four series of welders for varying duties are available: the CRA for general inert-arc welding production; the CCAT designed for inert-arc spot welding as well as manual and automatic operation; the CCA for automatic inert-arc and the CFR for manual inert-arc welding with an independent water-gas shut-off valve.

All models have built-in high frequency circuits for easy starting and built-in power factor correction for reducing kva demand.

An interesting feature is the remote-controlled high-frequency button mounted on the electrode holder. When the arc is broken at the finish of a bead, the gas flow is automatically cut off. The welder does not have to walk from the work back to the welder to shut off the costly inert gas. An "afterflow" tank on the CRA models provides a momentary flow of argon after the arc is broken so that the tungsten and weld area will be protected against oxidation while cooling.

Key to the numbers on the picture at left are as follows: (1) inert gas cylinder; (2) two-stage regulator with liter gage; (3) gas hose to solenoid valve; (4) gas inlet; (5) gas outlet; (6) inlet from water source; (7) water inlet to torch; (8) water outlet from torch; (9) outlet to water drain; (10) amperage control wheel; (11) inspection cover for secondary terminal board; (12) on-off switches for remote control of high frequency and inert gas; (13) electrode cable; (14) ground cable; (15) remote control cord; (16) fuse block; (17) remote control switch on torch; (18) spark gap setting.

All four series of welders are available in four capacities: 10-150 amp; 20-250 amps; 40-375 amp and 60-500 amps.

THE JOHN A. KERN CO., 224 No. Loomis, Chicago 7.

* * *

New Norton Wheel Cuts and Finishes Welds

THE new Norton "reinforced" hub abrasive wheel cuts off excess weld metal and then smooths it up to a fine finish. It is designed for right-angle portable grinders and sanders. The wheel is reinforced with layers of strong fabric material and includes a strong safety web molded into the hub side. Abrasive is sharp, durable "Alundum."

A special wheel pad kit assembled by Norton gives the customer a reinforced plastic pad (for backing purposes), a threaded steel flange nut, hex wrench, spacing washers and an adaptor. This kit will enable fitting a "reinforced" hub wheel on any standard right-angle grinder. Wheels are available from stock in 7 and 9-in. sizes.

NORTON CO., Worcester 6, Mass.

* * *

Gear-Type Tube Bender Handles Brass, Stainless

FULL 180-deg bends and positioning at any point on the tubing without dissassembly are two advantages claimed for new gear-type tube benders. They can handle copper, brass, aluminum or steel, including Bundy and thin-wall conduit. There are individual benders for $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$ and $1\frac{1}{8}$ OD tube sizes, nominal tube sizes $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$ and 1 in.

THE IMPERIAL BRASS MFG. CO., 1200 West Harrison St., Chicago 7.

New Turning Rolls Cradle Light Gauge Tanks

MADE especially to support light-gauge metal tanks for welding, the new Aronson "Trac Tred" turning roll features a roller chain with rubber tread shoes. The roll is constructed so that heavy walled vessels may also be handled.

For grounding purposes, brass feet can replace every fifth rubber foot. The track supports a surface of 68 to 105 deg of the circular being welded. The clutch mechanism at each sprocket is so designed that one end is engaged in forward rotation and the other in reverse, thus keeping the underside of the belt tight during rotation.

Turning speed varies from 0 to 100 ipm and is accomplished through a Graham transmission. Power is provided by a 220-volt, three-phase, 60-cycle, $\frac{3}{4}$-hp electric motor and transmitted through solenoid-actuated clutches. A "hold" switch energizes both clutches, either to hold the work in position or as an extra power factor. With switches off, the tank can be rotated manually.

Jack screws actuate one end of the powered and idler units for adjustment to size of tank. Only 4-in. travel on a steel dovetail is required for tanks five to 10-ft in diameter. Capacity varies from tank diameters of 5 to 10 ft and weights up to 10,000 lb. With one power unit and two idlers, top capacity is 15,000 lb.

ARONSON MACHINE CO., Arcade, N. Y.

* * *

Welding Fluxes Cleaned by Oakite Compounds

THREE functions are performed by a new pre-paint metal-cleaning material, Oakite Compound No. 33. In a single application, oil is removed, rust is cleaned off and soldering or welding flux is dissolved

for welding

New a-c inert-arc welder and track-type turning roll show the way to lower cost light metal fabrication. Other cost-cutters are a new abrasive wheel and a soldering torch using canned pressurized fuel

to prepare the surface for paint. In shops where the type of work precludes the use of automatic spray-type washing equipment, this compound may be applied by soap-tank or hand-swabbing methods.

OAKITE PRODUCTS, INC., 175 Thames St., New York City 6.

* * *

New Smith Welder Rated at 400 Amp

A NEW 400 amp a-c welding transformer, the Model 400E has a welding range of 70 to 585 amp. It retains a 75-volt open-circuit voltage.

Fan motor and capacitors of the 400E are easily accessible for maintenance through a hinged door at the front of the welder. Commercially available secondary connectors are standard equipment.

This welder, claimed to operate at high efficiencies, includes such other features as primary connections mounted in a standard knockout box for simple installation and a patented ball-bearing screw to move the coil quietly when adjusting the current.

A. O. SMITH CORP., P. O. Box 584, Milwaukee 1.

* * *

New Style Welding Gloves Added to Airco Line

THREE new styles of welding gloves labeled A, B and C have been added to the Airco line. The A gloves, most costly of the three, are made of soft, rugged carpincho leather with a wool-lined back for maximum heat resistance. The one-piece leather back that includes fingers and gauntlet eliminates exposed seams. Stitching is of the inseam type. Extra protection is provided by a ¼-in.-wide leather welt extending around the thumb seam and across the base of the fingers.

The B gloves are a gauntlet type in the medium price range and offers the same construction as type A. These gloves have palm, thumb and fingers made of chrome-tanned horsesplit; back is of No. 1 cow-split.

The C gloves, most economical of the three, offer construction features similar to B but have a two-piece lined leather gauntlet.

AIR REDUCTION SALES CO., 60 East 42nd St., New York City 17.

* * *

New Soldering Torch Works on Canned Fuel

A NEW portable hand torch lights with a match and burns with a clean, blue flame. Its maximum 1,200 F temperature is not high enough for welding but is well suited to brazing and silver soldering. Fuel is supplied in a disposable can—about the size of a beer can—which is removed and thrown away when it's empty. It takes only 20 seconds, says the company, to remove an empty container and put on a new can.

The specially-constructed can container seals into the "Prepo" torch so that when a valve is opened the burning tip can be lighted. Two interchangeable tips come with the torch—one for making a long, broad flame for heating large areas and one to provide a pin-point flame for soldering purposes.

The new "Prepo" fuel is a blend of liquid petroleum hydrocarbons which is self-pressurizing and self-vaporizing. At 74 F the internal pressure is 12 psi; at 100 F, 24 psi. The can is built to withstand 300 psi.

PRESSURE PRODUCTS CORP., 140 North Dearborn St., Chicago 2.

* * *

Can Install Air-Operation on Rocker Arm Welders

A COMPACT, self-contained attachment provides air-pressure operation for foot-controlled rocker-arm spot welders. It clamps to the upper horn of the welder and operates on a pressure of 15 to 20 psi.

The "Weld-Air-Matic" device includes an electric foot switch (not shown), a four-way operating valve and energizing coils. It requires a supply of 4 cu ft of air per minute with a minimum of 80 psi line pressure. All parts are mounted on a single aluminum alloy casting. Wearing parts are oil sprayed and a grease fitting for piston rod and bushing lubrication is included.

"Weld-Air-Matic" is available in three sizes, with strokes of 1½, 2 and 2½ in.

ROBERT W. HOFFMAN CO., INC., 32 So. Clinton St., Chicago 6.

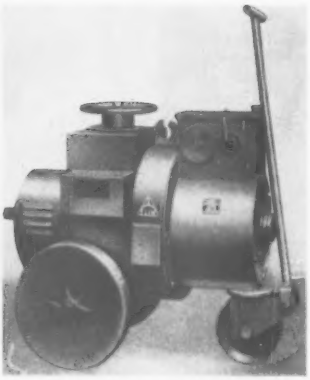
* * *

Magnets on Level Hold It to Work

A SMALL level for determining any angle up to 360 is equipped with powerful Alnico permanent magnets so that it sticks to round, flat or irregular metal surfaces. Both hands of the welder or fitter are thus freed for line-up and straightening.

The level has a clock-faced angle gauge and a balanced gravity needle rotating on jewel bearings. Its frame is a special aluminum alloy of high tensile strength, painted with a black-wrinkle finish. Dial is protected by "abuse-proof" plastic windows. It measures 9 by 2 in. weighs 10 oz.

THE BUCKEYE PLASTIC CORP., 740 Superior Ave., N. W., Cleveland.



300-Amp Austrian Welder Makes American Bow

A NEW 300-amp d-c motor-driven welder from Vienna, Austria, is in the American competitive picture. A fully NEMA rated welder, it is series-excited and employs the "cross field" operating principle.

In this set-up, working voltage is not induced directly by the primary flux between the two main poles but by the so-called "cross field," at right angles to the primary flux. This results in a steep volt-ampere curve, which limits the short circuit current to a definite value that cannot be exceeded. Use of this method is said to eliminate the need for auxiliary equipment.

Other features include: stepless, loss-free current regulation over the entire range of 60-375 amp; automatic voltage adjustment; "star-delta" control; calibrated dial; independence of rotation direction; portability; adaptability to both manual and automatic welding.

AMERICAN ELIN CORP., 1 Wall St., New York City 5.

* * *

Weldors' Goggles Have Helmet Headgear

A NEW AO headrest goggle for gas weldors, flame-cutters and brazers uses a "free-floating" headgear of the welding helmet type. A slight twist of a knob adjusts the goggle to the wearer's head size. The mechanism is enclosed in a fibre tube for insulation and to prevent hair from being pulled.

The new headgear is said to provide balance without overhanging weight. Goggles may be quickly changed to the "off-guard" position by a flick of the wrist.

These goggles may be worn over prescription glasses. They are well ventilated and have indirect side shields to keep out metal splashes and stray light rays. Either "Noviweld" or "Noviweld-Didymium" lenses are available in several shades. Replaceable cover lenses are provided to protect the filter lenses.

AMERICAN OPTICAL CO., Southbridge, Mass.

* * *

Low-Hydrogen Electrodes Eliminate Preheating

NEW low-hydrogen electrodes designated as Arcos "Tensilend" are said to remove the need for preheat in the welding of low-alloy, high-strength class.

"Tensilend 70", developed for steels in the 70,000 lb class, has the broadest application. With its stainless type coating and high-tensile weld deposit, it can be used for low-alloy high-strength steels and also for welding mild steel under highly restrained conditions, high carbon steels and sulphur bearing free-machining steels.

"Tensilend 120" for 120,000 psi steels was developed for marine work, such as welding armor plate. Further possibilities are being explored.

Special treatment of the "Tensilend" coatings includes a high-temperature baking to drive off moisture. A special package prevents moisture absorption before use.

Another advantage of this new series is easy handling (quiet arc and low spatter loss). Slag is easy to manipulate when molten and easy to remove when cold.

ARCOS CORP., 1500 South 50th St., Philadelphia 43.

* * *

Protective Hood Keeps Off Gases, Acids, Oils

RUBBERIZED safety hood protects the worker's face, head and neck from corrosive sprays, paint, oils, acids. It may be worn with goggles or respirator. A support frame in the hood increases comfort and effectiveness.

GENERAL SCIENTIFIC EQUIPMENT CO., 2700 West Huntington St., Philadelphia 32, Pa.

* * *

NEW BLADE-TYPE electrode holder has a capacity of 500 amp on 5/8-in. electrodes. The spring steel jaws are 7/8 in. wide and are grooved to hold the electrodes at four different angles in either the right or left hand. The new holder has few parts, all replaceable. Jackson Products, Warren, Mich.

Lightweight Cylinder Truck Carries Small Cylinders

A SINGLE-HANDED, two wheel truck for smaller compressed gas cylinders weighs in at less than 35 lb. Tires are 10 by 1.75 and are pressure mounted on wheels with oilless bearings. A chain for smaller cylinders is included. The platform is of one-piece construction.

AMERICAN METAL PRODUCTS CO., 34 Southbridge St., Worcester 8, Mass.

* * *

Odd Shapes Cut, Formed by New Baker Shear

NEW shearing machine cuts irregular shapes in either mild steel or stainless sheets up to 3/16 in. thick. No starting hole is required for inside cuts made with the special attachment provided. Metal may be cut to a scribed line or by template, if desired.

By substituting hammer type dies for the cutting tools, beading and forming operations can be performed in steel up to 1/8 in. thick. Throat depth is 48 in. and the stroke adjustment is variable.

BAKER BROTHERS, INC., 1000 Post St., Toledo 10, O.

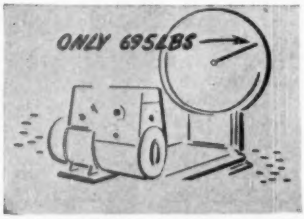
(Continued on page 74)

P&H gives you

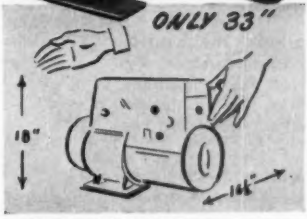
the only DC Arc Welder with *all* these tested time- and money-saving features

BUILT-IN REMOTE CONTROL Dial-lectric feature gives full arc-control at the work . . . saves operator's time . . . saves floor space for production.

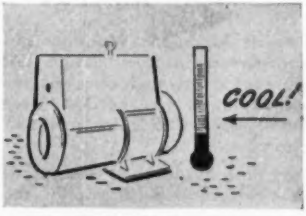
SLOW SPEED Lowest rpm per pound of weight. Only 1750 rpm for less wear, longer life, and minimum replacement costs. So quiet you hardly hear it.



LIGHT WEIGHT Easy to handle and move. Facilitates mounting off the floor and out of the way so there's more room for turning large weldments. Weighs only 695 lbs.



STURDY AND COMPACT Four sets of main brushes and one auxiliary set firmly fastened for good commutation. Simple design and rigid construction throughout . . . space-saving dimensions.



COOL OPERATION Slow speed plus extra large stator-frame cooling surfaces, and dual fans (for generator and motor) — make this the coolest welder you have ever seen.

● Stationary or portable mountings—Additional Features: single heat control; life-time sealed bearings; push-button start- and -stop switch with overload protection; high-low range switch; and polarity reversing switch. Get all the facts. Call your P&H representative, or send in coupon.

P&H **WELDING DIVISION**
Milwaukee 14, Wisconsin

HARNISCHFEGER CORPORATION

Uniform, top-quality electrodes for every job!

TEAR OUT COUPON AND MAIL TODAY!

HARNISCHFEGER CORPORATION, Welding Division 2117
4513 W. National Ave., Milwaukee 14, Wisconsin

Please send me Bulletin W-80 giving full details about the outstanding new P&H WFA-300 DC arc welding machine.

Name.....

Company.....Title.....

Address.....Home ☐ Business ☐

City.....(.....) State.....

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZER • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

OXYGEN AND ACETYLENE at 10% to 50% Discount

● Harris Automatic Welding Torches represent the biggest advancement in torch design since the original Torch. By means of a thumb controlled lever, the full flame is extinguished when not needed (except for a tiny acetylene pilot light) and relit instantaneously, without need for re-adjustment.

Every time the lever is used, money (oxygen and acetylene) and time are saved. Basically, that's why thousands are in use, especially on production welding work. The original cost of a Harris Automatic is saved many times over during its lifetime.

Further, the seven styles and sizes available are unusually good torches, characterized by exceptional flame range from each size of tip, freedom from "popping" and flashback and stand continuous operation under severe conditions.

Why use 1938 (or older) torches under 1948 conditions? Write us, or contact your nearest Harris Distributor for free demonstration.

THE HARRIS CALORIFIC COMPANY
CLEVELAND, OHIO

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

WELD DEFECT CHART

(See Also Article on Page 30)

TYPICAL DEFECTS FOUND IN SPOT WELDING AUSTENITIC STAINLESS STEELS AND PREVALENT CAUSES FOR THEIR OCCURRENCE IN ORDER OF THEIR IMPORTANCE

A - MATERIALS OF EQUAL THICKNESS

IDEAL

NUGGET

I-T-E CIRCUIT BREAKER CO.
SPECIAL PRODUCTS DIVISION

I Excessive expulsion at interface

1. Insufficient electrode force
2. Excessive current and/or weld time
3. Electrode dressing too sharp
4. Foreign matter on interface

II Surface expulsion

1. Electrode dressing too sharp
2. Excessive current in relation to pressure
3. Foreign matter on surfaces
4. Insufficient electrical and/or thermal conductivity of electrodes

III Excessive indentation

1. Electrode dressing too sharp
2. Excessive electrode force
3. Excessive current

IV Void in nugget

1. Insufficient electrode force
2. Excessive current and or weld time
3. Electrode dressing too flat
4. Insufficient "hold" time

V Cracks in Nugget

A Horizontal crack at center of nugget

1. Insufficient electrode force
2. Insufficient "hold" time
3. Electrode dressing too flat
4. Misalignment of electrodes

V Cracks in Nugget

B Vertical cracks in conjunction with voids

1. Excessive current and/or weld time
2. Insufficient electrode force
3. Electrode dressing too flat
4. Insufficient "hold" time

V Cracks in Nugget

C In crack sensitive metal

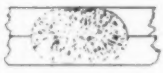
1. Insufficient electrode force
2. Electrode dressing too flat
3. Insufficient "hold" time
4. Insufficient weld time

VI Cracks in parent metal

1. Electrode diameter too small in relation to nugget diameter
2. Electrode dressing too sharp
3. Insufficient electrode force
4. Excessive current and/or weld time
5. Insufficient "hold" time

VII Undercise nugget

1. Insufficient current
2. Insufficient weld time
3. Excessive electrode force



VIII Excessive penetration

1. Excessive current
2. Excessive weld time
3. Electrode dressing too sharp
4. Insufficient electrical and or thermal conductivity of electrodes
5. Insufficient electrode force

IX Unequal penetration

1. Unequal electrode dressing
2. Unequal electrical and/or thermal conductivity of electrodes

X Unbalanced nugget

1. Misalignment of electrodes
2. Off-center dressing of electrodes

XI Concave sides of nugget

1. Insufficient weld time
2. Insufficient current
3. Electrode diameter too small

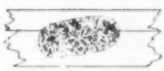
B - MATERIALS OF UNEQUAL THICKNESS

I Lack of penetration in thin sheet

1. Electrode dressing too flat on thin sheet
2. Excessive electrode force
3. Excessive electrical and/or thermal conductivity of electrode on thin sheet
4. Insufficient electrical and/or thermal conductivity of electrode on heavy sheet

II Lack of penetration in both sheets

1. Electrode dressing too flat
2. Excessive electrode force
3. Insufficient current
4. Insufficient weld time

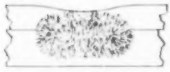


III Unbalanced nugget

1. Misalignment of electrodes
2. Off-center dressing of electrodes

IV Excessive indentation

1. Electrode dressing too sharp at indentation
2. Excessive electrode force
3. Excessive current and/or weld time
4. Electrode diameter too small at indentation



V Excessive penetration

1. Electrode dressing too sharp on thin sheet
2. Insufficient electrode force
3. Excessive current and, or weld time
4. Insufficient electrical and/or thermal conductivity of electrodes

VI Void in nugget

1. Insufficient electrode force
2. Excessive current
3. Excessive weld time
4. Electrode dressing too flat
5. Insufficient hold time

VII Cracks in Nugget

A Horizontal cracks at center of nugget

1. Insufficient electrode force
2. Insufficient hold time
3. Electrode dressing too flat
4. Excessive current and/or weld time

VII Cracks in Nugget

B In crack sensitive metal

1. Insufficient electrode force
2. Electrode dressing too flat
3. Insufficient hold time
4. Insufficient weld time

VIII Cracks in parent metal

1. Electrode diameter too small in relation to nugget diameter
2. Electrode dressing too sharp
3. Insufficient electrode force
4. Excessive current and/or weld time
5. Insufficient hold time

© 1950 I-T-E CIRCUIT BREAKER CO.

TRY THESE
HARD-FACING ALLOYS BY VICTOR

Made to *stretch working life* of cutting, drilling, and crushing equipment wherever *abrasion, impact, corrosion* and *heat* are encountered.

THEY ARE FASTER AND SMOOTHER!

	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTOR HS 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTOR HS 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

Available in a full range of sizes for both acetylene and electric AC and DC application. Try VICTOR hard-facing rods on your own job NOW. Save money two ways; (a) in time . . . application is faster and smoother; and (b) by stretching the life of equipment used under severe operating conditions. Order a supply from your dealer TODAY.

VICTOR EQUIPMENT COMPANY

ALLOY ROD AND METAL DIVISION

11320 S. Alameda, Los Angeles, California

3821 SANTA FE AVENUE · LOS ANGELES 58 844 FOLSOM STREET · SAN FRANCISCO 7 1312 WEST LAKE STREET · CHICAGO 7

VICTOR's line of welding and cutting equipment is complete. For data on items you are interested in, just fill in coupon.

VICTOR

Welding & Cutting Equipment

SINCE 1910

243

VICTOR EQUIPMENT COMPANY, 844 Folsom St., San Francisco 7, Calif.

We want to know more about these items:

- ☐ Hard-facing alloys.
- ☐ Welding and cutting units. ☐ Portable flame cutting machines.
- ☐ Gas regulators. ☐ Air filter-regulator-lubricator units.
- ☐ Blasting nozzles. ☐ Positioning power units. ☐ Fluxes.

Name _____

Position _____

Firm _____

Address _____ 2

For Your Technical Library—

Free Catalogs • Booklets • Bulletins

A Welding Engineer Reader Service

1 R-W ELECTRODES — Arcos Metal, Inc., Milwaukee 15. 4-page, two-color Bulletin RW2 describes and illustrates spot welding tips, seam and tube welding wheels, flash and projection welding dies, welder shafts and bushings. Special-shaped tips, water-cooled holders and connectors are also listed. Tip dimensions are listed.

2 FLAME CUTTING MACHINE—Indiana Oxygen Co., Indianapolis, Ind. Single-sheet bulletin depicts the "Cut-A-Line" Model 1000 flame-cutting machine. Control, speed, operating and driving mechanisms are discussed. Pictures show bevel, circle and circle-track cutting.

3 HARD-FACING GUIDE—Mix-O-Col Alloy Co., Inc., Los Angeles 31. New edition of the company's 36-page Welder's Guide to Successful Hard-Facing contains such valuable information as types of alloys, gas method, arc method, coefficient of friction, impact testing, jigs for hard-facing, preheating, skip welding, upsetting, metal shrinkage, etc. Booklet is pocket-size.

4 AUSTRIAN ARC WELDER—American Elin Corp., New York City 5. 4-page Bulletin RFN-300 explains features and describes construction of the Elin 300-amp d-c arc welder. Made in Austria, this welder employs slightly different operating principles. See Page 46.

5 INERT-ARC WELDER—John A. Kern Co., Chicago 7. Single-sheet bulletin describes the new Kern inert-arc welders for manual, automatic, spot-arc inert-arc and standard metal-arc welding. Each part on welder is labeled, all features explained, different types described. For more details, see Page 44.

6 LOW-HYDROGEN ELECTRODES—Arcos Corp., Philadelphia 43. Bulletin describes the Arcos "Tensilend" low-hydrogen electrodes for welding low-alloy, high-strength steels. It also tells the principle involved in welding with hydrogen controlled electrodes. See Page 46.

7 WELDED FABRICATION—Nooter Corp., St. Louis 4, Mo. 16-page two-color Catalog No. 150 offers a pictorial story of welding on steel and alloy tanks and pressure vessels. Four pages of valuable corrosion data are included. A special department for metallizing is also shown and its facilities pictured.

8 GAS WELDING RODS—The Reid-Avery Co., Inc., Baltimore 22. 4-page, two-color bulletin describes Reid-Avery oxyacetylene welding rods and wire for gas shielded arc welding. Seven grades of iron, mild steel and high tensile rods carried in regulator stock are listed as to analysis and diameters available.

HOW TO ORDER: Fill out one of the small card sections completely (name, address, your company, etc.) for each piece of literature you would like to have. Each card section must be completely filled out; do not use ditto marks. Each circle must contain the number that appears with the item on which you desire further information.

THE WELDING ENGINEER will request manufacturers to send readers the literature in which they are interested. Two post cards are printed here, each containing space for four items.

These cards not good after September 1, 1950

Write in circle number of item describing one catalog wanted → ○

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

Write in circle number of item describing one catalog wanted → ○

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

Write in circle number of item describing one catalog wanted → ○

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

Write in circle number of item describing one catalog wanted → ○

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

Write in circle number of item describing one catalog wanted → ○

Your Company Jones Mfg. Co.

Name John Smith

Address 321 7 Lewis Ave.

Chicago, Illinois

THE WELDING ENGINEER

CARDS NOT GOOD AFTER SEPT. 1, 1950

Place 1c Stamp Here

THE WELDING ENGINEER

520 NORTH MICHIGAN AVE.

CHICAGO 11, ILL.

9 GRINDING WHEEL—Norton Co., Worcester 6, Mass. 6-page, four-color folder describes the Norton "Reinforced" hub wheel for cutting off excess weld metal and then smoothing it down in a single operation. Construction of wheel, cutting features, safety precautions, and operating instructions are thoroughly discussed. 15 applications are named and 5 shown. See Page 44.

10 WELDING TEMPLATES—Rapidesign, Inc., Glendale, Calif. 8-page two-color Catalog No. 50 shows and explains 30 templates for drafting work such as welding symbols, circles, nuts and bolts, gear shapes, ellipses, stair layout, etc. Featured are templates made-to-order for private drawing room use.

11 WELDING GOGGLES—American Optical Co., Southbridge, Mass. Bulletin S895 describes new headrest welding goggles which employ the same type of headgear used in welding helmets. Lens types and shades available for the goggles are listed. See Page 46.

12 TRACK TURNING ROLL—Aronson Machine Co., Arcade, N. Y. 4-page, two-color Bulletin TT-1 shows the new Aronson track-type "Trac-Tred" turning roll for positioning light-wall cylinders. Construction of the tracks, operating speeds and diagrams show principle. For details, see Page 44.

13 WELDING GLOVES—Air Reduction Sales Co., New York City 17. Catalog 13 tells about three new styles of welding gloves carried by Airco dealers. Sewing, leather, linings, etc., are described on all three models.

14 A-C WELDER—A. O. Smith Corp., Milwaukee 1. Bulletin No. W-133 explains operating points and construction advantages of the new Smith 400-amp a-c industrial welder. See Page 45.

15 TUBE BENDER—The Imperial Brass Mfg. Co., Chicago 7. Single-sheet, two-color bulletin 302 shows new gear-type tube benders making bends in steel, copper, aluminum and brass tubing and conduit. See Page 44.

16 APPLICATOR BARS—Stula-Sickles Co., Newark 5, N. J. 2-page data sheet show how and where to apply "Manganal" applicator bars or special rolled shapes to jaw crusher, bull-dozer blades, etc. Sketches show procedure and materials.

17 ARC WELDER—Lejay Mfg. Co., Minneapolis 8, Minn. 6-page folder describes 200 and 250 amp arc welders rebuilt from aircraft generators. Engine-driven models and portable types are also discussed as are welding accessories, electrodes, etc.

18 PROPANE CYLINDERS—Harrisburg Steel Corp., Harrisburg, Pa. 4-page three-color folder tells about Harrisburg's "Lite-Weight" propane cylinders of 100 lb capacity. Manufacturing operations on the cylinders are also illustrated.

19 FLAME HARDENING—Air Reduction Sales Co., New York City 17. 12-page reprint on oxyacetylene flame hardening covers the materials which may be so treated and outlines various methods. The article, originally appearing in *The Welding Journal*, is illustrated with 22 photos plus cost and hardness tables.

20 STAINLESS WELDING FITTINGS—The Cooper Alloy Foundry Co., Hillside, N. J. 6-page folder No. 52W contains Cooper's latest prices for stainless steel elbows, return bends, stub ends, tees, etc., for welded piping. Fittings are made of types 304, 316 and 347 stainless.

21 INCLINABLE PRESSES—The Federal Machine and Welder Co., Warren, O. 8-page Bulletin OBI-3M presents many pictures and applications of "Warco" "inclinable" presses for blanking and forming sheet metal. Specifications, sectional drawings and other data are given for each press model.

22 PICKLING EQUIPMENT—The International Nickel Co., Inc., New York City 5. 8-page, two-color booklet tells how pickling departments can cut costs by using modern methods and materials. Illustrations show Monel pickling hooks, scrubbers, crates and baskets.

23 FIRE HAZARD INDEX—Randolph Laboratories, Chicago, 11. 36-page booklet lists 590 common and special chemical and gas fire-hazardous materials. After each chemical or substance, the correct extinguisher and extinguishing agents are listed.

24 AIR HAMMER—Borm Mfg. Co., Elgin, Ill. Single-sheet two-color bulletin describes the Borm Model G pneumatic hammer for weld peening, chipping, metal cutting, die work or general maintenance jobs. Nine tools for the hammer are illustrated.

25 ELECTRODE HOLDER—Jackson Products, Warren, Mich. Single-sheet bulletin describes the new Jackson blade-type electrode holder of 500-amp capacity. Diagram shows simple construction.

THE WELDING ENGINEER will request manufacturers to send readers the literature in which they are interested. Two post cards are printed here, each containing space for four items.

These cards not good after September 1, 1950

Place 1c Stamp Here

THE WELDING ENGINEER

520 NORTH MICHIGAN AVE.

CHICAGO 11, ILL.

Write in circle number of item describing one catalog wanted →

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

Write in circle number of item describing one catalog wanted →

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

Write in circle number of item describing one catalog wanted →

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

Write in circle number of item describing one catalog wanted →

Your Company.....

Name .....

Address .....

..... Title.....

THE WELDING ENGINEER, JUNE, 1950

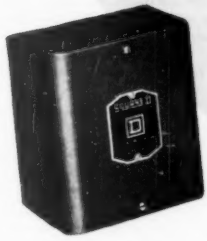
ANOTHER EXAMPLE OF

DESIGN LEADERSHIP*

SQUARE D's NEW 4-way VALVE for SPOT WELDERS

ROTARY MOTION

FOUR-WAY
3/8" PIPE



Fast Operation—Direct-acting magnet...short, rotary motion . . . will operate up to 600 times per minute.

Fast Air Movement—Internal port areas greater than 3/8" pipe area . . . minimum resistance to flow . . . designed to get maximum response speeds from welding guns or stationary machines.

Long Life—Pressure-balanced rotor . . . hardened magnet parts . . . oilite pivot bearings . . . spring loaded vanes to provide positive air seal after millions of operations.

Low Power Consumption—Magnet coil requires only 38 V.A. at 60 cycles . . . inrush 215 V.A.

Compact—Overall size only 5¾" x 6½" x 4".

Accessible—Valve body and magnet structure removable without disturbing pipe connections . . . magnet coil easy to change.

Easy Installation—Mounts in any position . . . cast base with 3-point mounting reduces possibility of distortion.

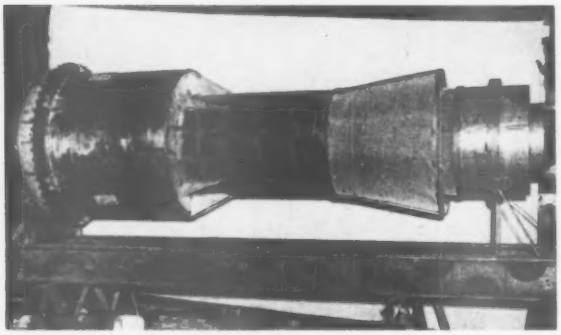
Write for Bulletin 9043 Type C, Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

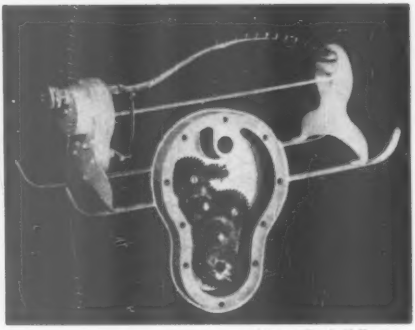
DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

on the job . . .



LOWER MAINTENANCE costs were effected with this replacement unit of corrosion-resistant stainless. Storts Welding Co., of Meriden, Conn., did the job



Courtesy Handy & Harman

GEARS FOR lawn sprinkler are silver brazed to shafts. Formerly, shafts were square and their ends peened over

Stainless Rinsing Unit

A LARGE tumbling machine had a washing and rinsing unit made of carbon steel. Rapid corrosion set up a difficult cleaning and maintenance problem. It was decided to replace the rinsing unit with one of corrosion-resistant stainless.

The job was awarded to the Storts Welding Co., Meriden, Conn. What the thing looked like may be seen from the left picture above. The first section (left of picture) is a drum 38½ in. long and 35 in. in diameter. The drum was fabricated of 11-gauge stainless (type 304); the same sheet stock was used for the triangular gussets that hold the drum in rigid alignment with the mesh cylinder.

The second section is a 24-in. cylinder of 3½ mesh. This is 40 in. long. Next to it comes a 24-in. cylinder of 2 mesh, 28 in. long. The latter coarse mesh allows the tumbling materials to drop through into an outside cone (of 5½ mesh) and be discharged into a hopper. The work is passed through the discharge hopper to the next operation.

The means of propelling the work is a worm 4 in. high that is made of 14-gauge strip. The worm is welded to the inside surface of the drum and continues all the way through to the discharge hopper at the right end of the picture. It has a 7-in. pitch and coils around the inside of the drum four times.

To provide the tumbling action, formed pieces of 11-gauge sheet were welded perpendicular to the worm at regular intervals along the inside wall. These pieces are shaped like inverted V's.

It all sounds very complicated, and it wasn't too easy a piece of machinery to construct. The carbon-steel original had to be shipped to the Storts plant so that all of the dimensions could be checked accurately. No mistakes were allowable because this unit had to fit perfectly into a larger machine.

The type 304 stainless used in the fabrication of this replacement unit was welded throughout by the metal-arc process with stainless electrodes.

The original forged-steel tires and the gears (shown in position at the ends) were salvaged and used over again. It was important to preserve the alignment of the tires and gears so that the unit would operate smoothly when it was fitted into the larger machine.

* * *

Gates Get Face-Lifting

THE 28 INTAKE control gates of a power development on the St. Lawrence river, near Montreal, became so corroded about two years ago that they had to be restored. Each gate is 24 ft wide by 32 ft by 30 in. thick. They are made out of riveted steel plates.

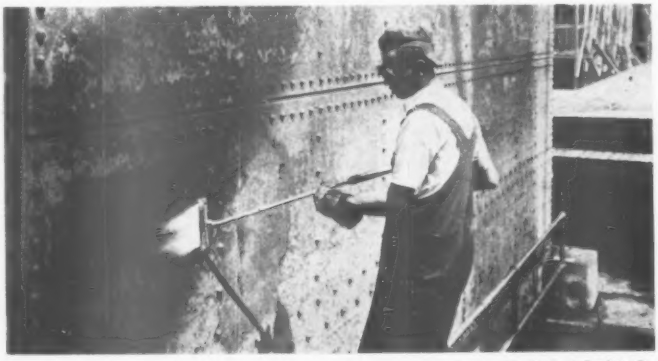
Rusting was especially bad around the rivet heads, where large rust "scabs" had formed. Each gate was also covered with mud. It was lifted by a gantry crane, washed, scraped and brushed. When all mud and dirt had been removed, the gate was cleaned with oxy-acetylene flames (see picture). The high heat of the flames popped off the scale and dehydrated all of the rust. The metal was then wire brushed to get rid of the loosened scale.

Painting was done while the metal was still warm and dry. The paint went on easy when applied immediately after the flame-priming. Also, the warm steel gave a low-temperature bake that increased the durability of the paint film.

Savings from Silver Brazing

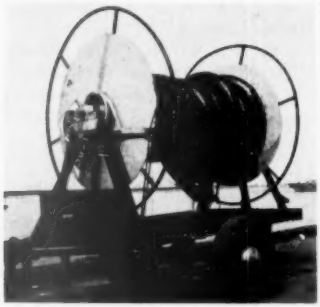
RIGHT PICTURE above shows train of gears in the water motor of the Avon lawn sprinkler. These brass gears were formerly made by broaching in them square holes to fit square shaft ends, which were afterwards peened over. Now the gears are silver brazed to round shafts. The brazing time is less than a minute, for the whole train. Manufacturing costs are much lower; field failures have been eliminated.

Still further savings are expected to result from: (1) brazing the spray nozzles of the sprinkler to the oscillating water tube and (2) brazing stamped steel components together to make the gear housing. The silver-brazed housing would replace the casting now being used.



Courtesy The Linde Air Products Co.

FLAME-PRIMING was done with a high-velocity 6-in. heating head mounted on an extension



Courtesy The Lincoln Electric Co.

PORTABLE WELDED reel lets harbor crews go into quick action. Hose is used to get rid of "oil slicks" that might cause fires

"Oil Slick" Hose

A LITTLE oil on the waters of a harbor can sometimes cause fire damage amounting to millions of dollars. Dangerous "oil slicks" can now be quickly removed by harbor crews.

The outfit above is brought into action when the amount of oil is great enough to endanger the property of the harbor. The cork hose (covered with a fireproof material) is let out in the water surrounding the oil slick. Hay or straw is thrown into the area of the hose to absorb the oil. The oil-saturated hay is then pumped through the floating hose onto small rafts, which are towed away and dumped.

The welded reel is made from round steel bars, mounted on angle uprights. At the left end of the drum is the brake that locks the reel in position.

* * *

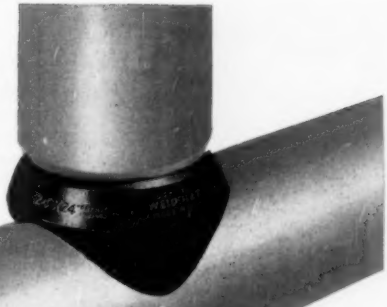
No Leaky Tanks

MCHALE MFG. CO., Los Angeles, tests welded seams of stainless milk storage tanks with a special leak detector manufactured by the General Electric Co. It's done by passing the barrel of a hand-held "gun" along the weld. When a leak is found, the control unit shows it instantly.

McHale fabricates very large refrigerated tanks (up to 15,000 gallons) for farmers and creameries to use to keep milk fresh until it's ready for processing. If a leakage occurred, permitting the refrigerant to escape, the entire contents of a tank would be spoiled. Hence the need to make certain of airtight welds.

The testing is done rapidly and with great accuracy by means of the portable leak detector. A small amount of carbon tetrachloride introduced into the refrigerating system enables the leaks to be quickly located. The instrument, says its manufacturer, can detect a leak so small that in one year only 1/100 of an ounce of carbon tetrachloride would be able to pass through the opening.

The control unit, operating from 115 volts, 60 cycles, is compact enough to be carried by a handle or slung on the shoulder with a strap. Headphones can be used with it if an audible indication of a leak is desired.



WeldOlets, Butt Welding — Available as standard, with outlet sizes from ⅛" to 24", both straight and reducing for use with Schedule 40 pipe up to 12" outlet. Outlet sizes 12" - 24" for standard weight pipe (⅜" wall). Also available for Schedule 80 services through 8" outlet and extra strong through 24" outlet size (for use with pipe having ½" wall).

You write

SPEED, ECONOMY AND FULL PIPE STRENGTH

***into the job when you specify* WELDOLETS**

With WeldOlet branch pipe welding fittings you provide the quickest, most economical, most satisfactory method of obtaining full pipe strength at branch connections.

Note in the above illustration how the WeldOlet tapers to provide a single bevel groove joint at the crotch section and blends into a V-butt joint at the ear portion.

WeldOlets need no additional reinforcement to establish and fully maintain original strength on ASTM A-106 Seamless Steel Grade A Pipe, as set forth in Code for Pressure Piping, American Standards Association, B31.1-1942, and Supp. No. 2, B31.1-b-1947.

To meet special conditions, these fittings can be furnished in any forgeable metal including wrought iron, toncan iron, nickel, Monel, Everdur, stainless grades 304, 316, 347, etc.

For detailed engineering reference data, write for Catalog W-2.

BONNEY FORGE & TOOL WORKS

***Forged Fittings Division,* 364 Green Street, Allentown, Pa.**

Authorized Canadian Factory Representatives:

Sterling Steel Co., Ltd., 267 Davenport Road Toronto 1, Canada

WELDOLETS

FOR WELDED BRANCH PIPE OUTLETS

WeldOlets, Socket Welding —Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedules 80 and 160 up through 4" outlet size.

ThredOlets — Available as standard, with outlet sizes ⅛" - 10", both straight and reducing, for use with Schedule 40 pipe. Also available in Schedule 80 up through 2" outlet size.

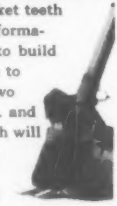
Fig. 1 — Cut-away view of reducing size WeldOlet with welding outlet in place. The external rib and wide bases or footings of WeldOlets eliminate the need for extra supports to take care of bending or vibrational stresses at crotch section, the point of greatest stress.

Fig. 2—Note blending of ear portion of welding fitting to run pipe. Extension of weld metal below inside scarfed portion of pipe insures all sections of joint greater than pipe wall thickness.

ANNOUNCING another Made-To-Fit-Your-Job ELECTRODE BY

Low Temperature EUTECTIC WELDING ALLOYS

EUTECHROM 10 FOR YOUR HARD OVERLAY JOBS demanding resistance to impact and abrasion



Here's an example: For bucket teeth tips, working in hard shale formations, use EutecTrode 680 to build up the manganese steel tips to shape. Then overlay with two layers of EuteChrom 10 . . . and you will have a surface which will outlive any other overlay on the market. No ill effects on the parent metal, because it's a "low heat" operation.

DEMAND THESE RESULTS on *YOUR* OVERLAY JOBS!

For any kind of overlay job . . . especially if it demands resistance to impact and abrasion, specify EuteChrom 10—Eutectic's new easy-to-use electrode for hardest overlay. This electrode develops a Rockwell "C" hardness between 63 and 68—roughly the equivalent of Brinell 672 to 740 . . . about as hard as a weld can be! Use EutecTrode 680 first, as the ideal cushion material—then apply EuteChrom 10, *both* at low heat.

plus **A service no other welding rod manufacturer can give you. 200 trained District Engineers everywhere . . . to study your welding problems . . . to give you free demonstrations . . . in your shop. 120 "made-to-fit-your-job" Eutectic Alloys available.**

EUTECTIC WELDING ALLOYS CORPORATION

40 Worth St. New York 13, N. Y.

FREE Write for Eutectic's "Repair Clinic" free booklet . . . showing hundreds of ways you can reduce your production or maintenance costs. Or if you prefer, request our District Engineer to give you a FREE consultation-demonstration in your own shop.

Name_____

Address_____

City_____ State_____

WELDING CONFERENCE

(Continued from page 42)

ries connection being most frequently used. In designing multitransformer presses, the utmost emphasis should be given to minimum maintenance requirements and maximum ease of maintenance. Downtime on a poorly designed or poorly maintained machine can easily cancel out its production advantages.

The problems involved in providing an adequate power supply for multitransformer welding presses were discussed by T. F. Ellis, Kaiser-Frazer Corp., Willow Run, Mich. The information he presented was compiled from experience with a large installation of resistance welders including a relatively high percentage of multitransformer welding presses.

R. R. Rottier, General Electric Co., Schenectady, took up the problem of tube requirements for frequency-changer welders. In general, the service demanded of ignitron tubes is more severe with low-frequency power than in conventional single-phase welding. Developed especially for this rugged service is a new frequency-changer ignitron (RMA type designation 5822) that will conduct nearly twice the peak and average currents of the equivalent-size single-phase tube.

Power Supply Session

The final session, on Friday afternoon, was on power supply questions. Co-chairmen were H. W. Tietze, Public Service Electric and Gas Co., Newark, N. J., and W. K. Boice, General Electric Co., Schenectady. C. E. Smith, of Resistance Welder Corp. at Warren, O., acted as secretary of the session.

W. K. Boice, one of the co-chairmen, also had a paper on the probabilities of interference between resistance welders. He presented calculated data concerning the probability that the voltage during a resistance weld would be inadequate because of the voltage drops due to other welders.

Lawrence Brieger, Consolidated Edison Co. of New York, Inc., gave a paper on the effect of the duration of voltage dip on cyclic light flicker.

R. C. Wilson, Trumbull Electric Mfg. Co., Plainville, Conn., talked on a low-voltage drop busway for welder feeders.

C. W. Wright, Delco Products Div., General Motors Corp., Dayton, O., discussed a welding power system with series capacitators at the main transformer primaries.

Welding Show

Marking an innovation from the first Electric Welding Conference (held in December of 1948), the second conference included practical demonstrations of electric welding techniques and equipment. This exhibition was sponsored by the Detroit section of the American Welding Society and was staged in the basement of the Rackham Memorial building, 5:30 to 10:00 p.m., Thursday and Friday evenings. D. H. Corey, Detroit Edison Co., headed the demonstration committee.

Practically all leading welding distributors in Detroit participated. Exhibits for the manufacturers they represented were put on by C. E. Phillips & Co., Weldit, Inc., Robinson Welding Supply Co., Welding Sales and Engineering Co., Welding Gas & Equipment Co. and Roy Smith Co. Several other exhibits were put on by manufacturers directly.

Strolling among the various displays, the writer found most noteworthy:

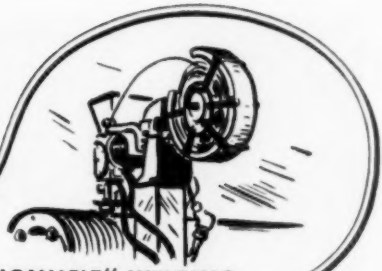
A new I^2T indicator for measuring amperes-squared-seconds; a new resistance indicator for flash welders, seam welders and tube mills; a new universally balanced 500-lb positioner; two types of stud welders, one using studs with a small projecting tip (1/32 in. in diameter and 1/32 in. long) in place of flux; a hydraulically controlled a-c welder; an a-c welder controlled by a saturable reactor with two coils fed by rectified direct current; another a-c welder with no moving parts—not even a fan. These, of course, are only some of the highlights; it wouldn't be possible to describe all of the products that were shown and demonstrated.

Total attendance at the conference was 414—a gain of five over the 409 registrants at the 1948 conference.

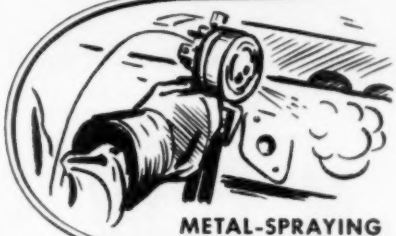
To sum it all up, the second Electric Welding Conference was on a more ambitious scale than the first and was perhaps a trifle more smoothly executed. Great credit should be given to the men who conceived and carried it out.

HASTELLOY TRADE-MARK *Alloy Wire*

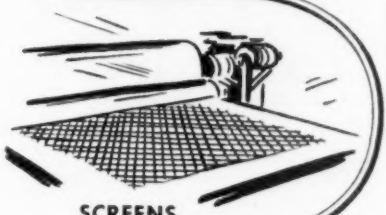
FOR METAL-SPRAYING, WELDING, and FABRICATED WIRE PRODUCTS



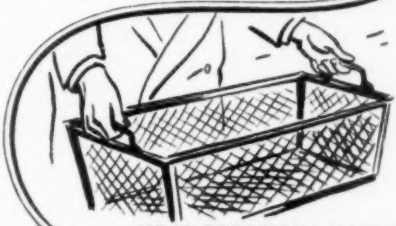
"UNIONMELT" WELDING



METAL-SPRAYING



SCREENS



HEAT-TREATING BASKETS

HASTELLOY nickel-base alloys, in the form of drawn wire, are available for the fabrication of corrosion-resistant screen, cloth, and baskets. The wire is also excellent for metal-spraying and for many types of automatic welding and hard-facing.

HASTELLOY alloys have a tensile strength comparable to that of the high-strength alloy steels, and possess unusual strength even at elevated temperatures. These alloys are specially designed to withstand the most severe conditions of chemical corrosion. Nickel-molybdenum alloy B is particularly resistant to hydrochloric and sulphuric acids, many organic acids, and all alkalies. Alloy C, a nickel-molybdenum-chromium-tungsten-iron composition, has excellent resistance to strong oxidizing agents, such as ferric chloride and wet chlorine, and is outstanding in its resistance to brine and salt spray.

In addition to HASTELLOY alloy wire, you can also obtain wire made of MULTIMET alloy—a cobalt-chromium-nickel composition developed for service at elevated temperatures.

Cut and straightened lengths or coils, in diameters down to 0.060 in., can be obtained directly from Haynes Stellite Company, Kokomo, Indiana. Wire in diameters less than 0.060 in. down to 0.002 in. is available from an associate company, Kemet Laboratories Company, Inc., Madison Avenue and West 117th Street, Cleveland 1, Ohio. For more complete information, write for a copy of the booklet, "HASTELLOY High-Strength, Nickel-Base, Corrosion-Resistant Alloys."

HAYNES TRADE-MARK *alloys*

Haynes Stellite Division
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

The terms "Haynes," "Hastelloy," "Multimet," and "Unionmelt" are trade-marks of Union Carbide and Carbon Corporation or its Units.

WELDING DISPLAY occupies large area in G-E's "More Power to America Special" 10-car sales-display train. See Page 27

OVERHEAD arc welding was taught by Bob Beecaw at Purdue Welding Conference, May 3 and 4. Advanced gas welding was also taught

NEWS OF WELDING AND WELDING MEN

Weldment Shipments Up, Reports American Welding

SHIPMENTS of welded products were up 19% for the first quarter of 1950 over the same period last year, reported William J. Sampson, Jr., president of the American Welding & Mfg. Co., Warren, O. Mr. Sampson also predicted that the firm would enjoy as good business during the rest of the year as in the first quarter. As evidence, he pointed to a 20% greater backlog on order during April.

* * *

"Packaged" X-Ray Service Offered by General Electric

A "PACKAGED" X-ray service that includes not only equipment but maintenance, repair parts, tubes and instruction is being offered by the General Electric X-Ray Corp., Milwaukee. Called "Maxiservice," the plan follows a trend in the industrial field toward service-and-rental systems. A single monthly charge covers everything: the welding customer can have the benefits of X-ray inspection without a heavy investment in capital goods.

According to President John H. Smith, of G-E X-Ray, the chief limitation in the use of X-ray inspection has been the initial investment in equipment. The one monthly charge for "Maxiservice," covers rental of the equipment, maintenance calls, new tubes and other replacement parts, even property taxes and interest costs.

* * *

Marquette Welds Racers at Indianapolis Speedway

MARQUETTE Mfg. Co., Minneapolis, Minn., furnished its welding and battery charging service for Indianapolis Speedway racers again this year.

This is the third consecutive year the company has operated the "official service" for the cars. During the 1949 event more than 540 welds were made at the track. All 33 of the cars that qualified for the big race had one or more welds.

* * *

Purdue Conference Offers Training, Technical Papers

A double-barreled program of technical welding papers and advanced arc and gas welding instruction kept visitors busy at the Purdue Welding Conference, Lafayette, Ind., May 3 and 4. Ten papers and a panel discussion were presented at the Memorial Union Building. The welding school was conducted under the name of the Purdue Weldor's Institute at the Purdue Fieldhouse.

Chairman of the Wednesday morning session at the Union building was W. G. Fassnacht, Bendix Aviation Corp., South Bend, Ind. New developments in induction heating and brazing as well as other phases of brazing were presented by H. E. Scarbrough, General Electric Co., Chicago. Furnace brazing of assemblies with copper brazing alloy is one of the most economical and reliable fabrication methods known, he declared.

Down-to-earth discussion of unfired pressure vessel codes was accomplished by Harry C. Boardman, Chicago Bridge and Iron Co., Chicago, in the second morning talk. Such codes are still being revised and must always be examined for discrepancies, overlapping jurisdiction, pointless requirements and omissions, he said. Some limitations on cold working of steel before welding it into other assemblies should be studied, he advised. While heavily cold-worked steel will weld and test out according to most codes, he cautioned, much of its natural ductility and notch toughness have probably disappeared.

Wednesday afternoon's sessions were presided over by Professor R. W. Lindley, chairman of the manufacturing process laboratories, Purdue University. Successful welding of 2-in. and higher aluminum plate was described by C. B. Voldrich, Battelle Memorial Institute, Columbus, O., in the opening paper. Good ductility was obtained in such welds when using 2S alloy filler wire, reported Mr. Voldrich, but weld strength was quite low. Using other alloys for filler metal raised weld strength, he said, but at the sacrifice of ductility. The new automatic inert-gas-shielded metal arc processes have proven highly successful on such plates.

The economical design of welded buildings was graphically illustrated in slides accompaying a talk on that subject by Van Rensselaer P. Saxe, Consulting Engineer, Baltimore, Md. Some early buildings constructed by welding were shown as well as some recently completed. Details of erection, beam and column practice and other structural considerations in relation to welding were discussed.

Welded Diesel cylinder heads were shown in slides used by Homer E. Gannett, electrical engineer, Chicago, Burlington & Quincy Railroad, to illustrate his talk on railroad welding. Cost figures favoring welded construction over other methods of fabrication and maintenance were quoted by Mr. Gannett. Railroads could still save a great deal of money by more freely adopting welding, he indicated.

Welded vs. forged and cast steel structures with regard to load carrying capacity was the theme of a panel discussion held

(*Continued on page 62*)

WEAR PATTERNS

— *can be corrected* —

WITH 7 BASIC

WEAR-ARC HARD FACING ALLOY ELECTRODES

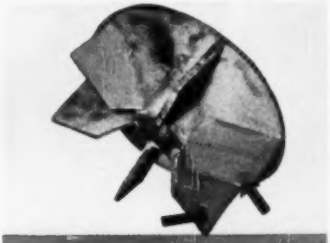
presented by Alloy Rods Co.

FOR FAST — ECONOMICAL — EFFICIENT
***Rebuilding* & *Hard Facing* AGAINST**
ABRASION • IMPACT • COMPRESSION • CORROSION • HEAT

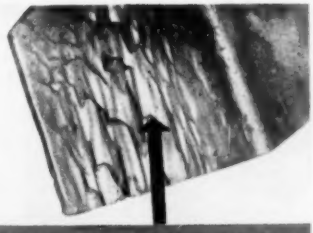
These low cost hard facing electrodes can save you money. *One* of the basic *WEAR-ARC* hard facing alloy electrodes or a combination, will correct the majority of wear patterns. Be sure you ask for *WEAR-ARC*.

Alloy Electrode	Recommended Use	Typical Applications
Wear-Arc "3"	Build-up Alloy for Carbon Steel Parts Subjected to Severe Impact, Abrasion and Compression.	All Carbon Steel Parts
Wear-Arc "WH"	Build-up Alloy for Manganese and High-Carbon Steel Parts Subjected to Severe Impact, Abrasion and Compression.	Steel Mill Roll Wobblers Gyratory Crusher Mantles & Concaves, Churn Drill Bits, R.R. Frogs, Switch Points, Crossovers
Wear-Arc "6"	Heavy Impact, Abrasion and Compression	Dipper Teeth and Lips, Crawler type Tractor Rolls and Grousers
Wear-Arc "12"	Impact and Abrasion	Rock Crushers, Sprockets, Pulverizer Hammers, Dipper Teeth and Lips
Wear-Arc "28"	Light Impact and Severe Abrasion	Centrifugal Pump Casings and Impellers, Pulverizer Bull Rings, Mill Hammers
Chrome-Boride	Severe Abrasion	Muller Plows, Pug Mill Knives, Sizing Screens, Plow Shares
Wear-Arc "FP"	Impact, Heat, Compression and Abrasion	Steel Mill Guides, Tong Bits, Feed Cams, Churn Drill Bits, Forging Dies

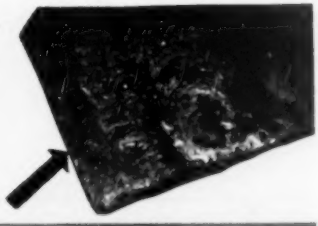
For complete details, see your nearest Alloy Rods Distributor or write, 'phone or wire Alloy Rods Co. — *If you are a distributor and are interested in hard facing electrodes, write us for our proposition.*



WHEN WEAR PATTERN STARTS



DON'T LET IT CONTINUE THUS



USE WEAR-ARC TO HARD-FACE

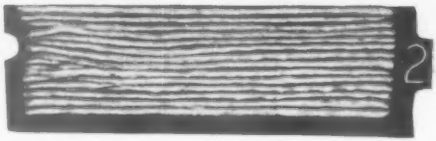
Impellar blade showing wear pattern caused by abrasive action. Corrected with *WEAR-ARC* hard facing alloys.

ALLOY RODS CO.
5560 WEST MARKET STREET
YORK, PENNSYLVANIA

Alloy Rods Co. YORK, PA.

Look for the FLAMING-ARC trademark

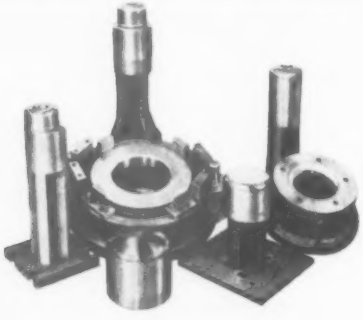
30% longer wobbler end life with Ampco-Trode overlays— The maintenance of rolling mill wobblers is a "natural" for Ampco-Trode 200. They must possess the ability to withstand tremendous loads and impact. The smooth deposit requires no grinding and has excellent bearing qualities. Wear-resistance combines with high compressive strength to take heavy loads without squashing, high impact without flaking.



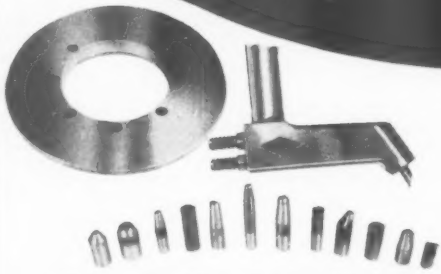
Ampco-Trode overlays more than double bearing shoe life — Locomotive roller-bearing shoes last thousands of miles longer with Ampco-Trode 200 overlays. Number 2 binders, the most severe location, last 80,000 miles — compared to 40,000 for phosphor bronze wear plates. Shoes in 1, 3, and 4 locations last 300,000 miles between shoppings. New shoes are given a two-layer, 5/16" overlay (3½ hours welding time); worn shoes are rebuilt with a one-layer, ¼" overlay (2 hours welding time).

Phos-Trode overlays save $4000 on one job — Twenty years of cavitation and pitting nearly destroyed the vanes and buckets on these 4-ton turbine runners. Replacement would have cost $6000 — had the original patterns been available. Rebuilt with corrosion-resistant Phos-Trode overlays, the turbine was as good — *or better* — than new, the original contours restored at a fraction of the cost of replacement.

Ampco Bronze



Ampco-Trode overlays outlast chrome plate 4 to 1 — A large Detroit manufacturer carefully counted the costs on these draw punches and rings. They found that overlays of Ampco-Trode 300 lasted 4 times as long as chrome plate. The longer life more than offset the lower initial cost of chrome. In addition, press-room efficiency increased nearly 15% by eliminating down-time previously required to hone and polish dies in the middle of production runs.



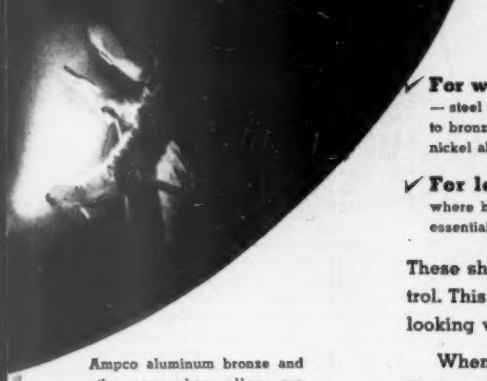
Resistance-welding costs cut with long-wearing Ampco electrodes — Rigorous production schedules call for trouble-free operation. Ampco resistance-welding electrodes are ideal for this kind of service. They combine hardness and toughness to resist mushrooming and wear. Their high electrical conductivity resists sticking to the work. They need less dressing — reduce downtime, increase production. The complete Ampco-weld line — tips, wheels, dies, standard and special holders — are made of alloys with the highest physical properties. All meet or exceed RWMA specifications.

Fabricated with acid- and corrosion-resistant Ampco-Trode — This conveyor was fabricated to handle bulk material saturated with 10% H_2SO_4 at 210° F. Specifying component parts of Ampco aluminum bronze alloys in varying grades met the severe requirements for corrosion resistance. The assembly was fabricated with Ampco-Trode 10 which matches the acid- and corrosion-resistant properties of the parent metal in the component parts.

Quick, low-cost repairs of cast iron with Ampco-Trode — This cast-iron road-grader housing was shattered when a driveshaft broke. Replacements were not available, so Ampco-Trode 10 took over. All joints were V'd out, the welding done in two layers — the first with an 1/8" rod, the second with a 3/16". Only slight pre-heating was required. One of the breaks passed through a machined flange. But Ampco-Trode 10 provided a machineable deposit as well as proper strength and ductility. The repair job was solved easily and quickly — at a real saving in time and money.

AMPCO®

Electrodes save you time and money in fabrication, repair and maintenance — by making tough welding jobs easier



✓ **For welding dissimilar metals** — steel to clean cast iron; steel or cast iron to bronze, brass or copper; and all these to nickel alloys.

✓ **For corrosion-resistance**— extremely useful when fabricating process-industry equipment.

✓ **For long-wearing overlays**— where hardness and resistance to wear are essential factors.

✓ **For ideal bearing qualities**— mates against hardened steel without seizing or galling.

These shielded-arc electrodes are manufactured under strict laboratory control. This assures absolute uniformity. You can always count on sound, good-looking welds when you use Ampco Bronze electrodes.

When you are faced with a tough welding job, try Ampco electrodes. Their wide range of usefulness and flexibility are almost sure to give you the solution at a substantial saving in time and costs. See your nearest Ampco distributor. Send coupon for complete catalog of money-saving Ampco electrodes, and helpful information on welding techniques.

Ampco aluminum bronze and other copper-base alloys are available in a variety of grades to meet your exact requirements in the form you need: — rolled sheet or plates, sand or centrifugal castings, forgings or extrusions, resistance-welding electrodes, corrosion-resistant centrifugal pumps and plug-valves.

Free

Catalog W-17, "Welding with Ampco Bronze Electrodes"
Catalog No. 688 — Resistance Welding Electrodes and Alloys
Ampco Alloys for the Process Industries (CEC reprint)

Tear out this coupon and mail Today!

AMPCO®

Ampco Metal, Inc.
Milwaukee Wisconsin
West Coast Plant • Burbank, California

Ampco Metal, Inc., Dept. WE-6, Milwaukee 15 Wis.

I want the money-saving facts about Ampco Bronze electrodes. Send me, without obligation:
Check:
☐ Arc-welding Catalog W-17 ☐ Resistance Welding Catalog 688
☐ Ampco Alloys for the Process Industries (CEC reprint)

Name _____

Company _____

Company Address _____

City _____ ( ) State _____

NEW

for better welding
of high tensile steels

ARCOS TENSILEND

Low Hydrogen Electrodes

These new Tensilend Electrodes have been developed and added to the Arcos low hydrogen family to help you overcome fabricating problems on high tensile steels. Tensilend 70 is the electrode that will fit the widest range of applications. Tensilend 100 and 120 provide unique properties to meet specialized requirements that can be met by no other electrodes.

No Preheat Needed
When welding low alloy or high carbon steels

Underbead Cracking Eliminated
Stainless type coating controls hydrogen

Superior Physicals
High ductility and impact strength

Savings In Electrode Inventory
One electrode welds high strength, low alloy steels, mild steel under highly restrained conditions, or sulphur-bearing free machining steels.

ARCOS CORPORATION
1500 South Fiftieth St., Philadelphia 43, Penna.

The ABC'S of Welding High Tensile Steels

Write for bulletin that will square you away on low hydrogen electrodes in simple question and answer form and tell how to get better welding of high tensile steels.

WELD WITH

ARCOS

Specialists in Stainless, Low Alloy and Non-Ferrous Electrodes

Purdue Conference . . .

at the Union Wednesday evening at 8 p.m. Chairman of the panel was Professor George M. Enos of Purdue. Professor R. G. Sturm, of the Purdue department of civil engineering, was moderator. Members of the panel included Peter L. Vissat, Taylor Forge & Pipe Works, Cicero, Ill.; Charles T. Johnson, Graver Tank and Mfg. Co., East Chicago, Ind. and Professor Enos.

No sharp disagreement was voiced as to the absolute utility of any particular method of fabrication. All three men agreed that in certain uses, each has advantages and in some cases, all three methods should be used for greatest economy and strength.

Harry Johnson, Wayne Welding Supply Co., Inc., Fort Wayne, Ind., was chairman of the Thursday morning sessions. First paper was given by Clyde G. Bassler, Taylor-Winfield Corp., Chicago. He spoke on power problems of resistance welding in the small shop. As a rule, small shops may install series capacitors to correct their power factor and current demand for welding operations. Such capacitors are fairly flexible, quite economical and work quite well with spot, seam and projection welding.

Welded bridges were discussed by La Motte T. Grover, Air Reduction Sales Co., New York City. He showed slides of various European efforts in this line and also some American examples. He said he thought many structural shops will change to welded fabrication when they are sure of some continuity of such contracts.

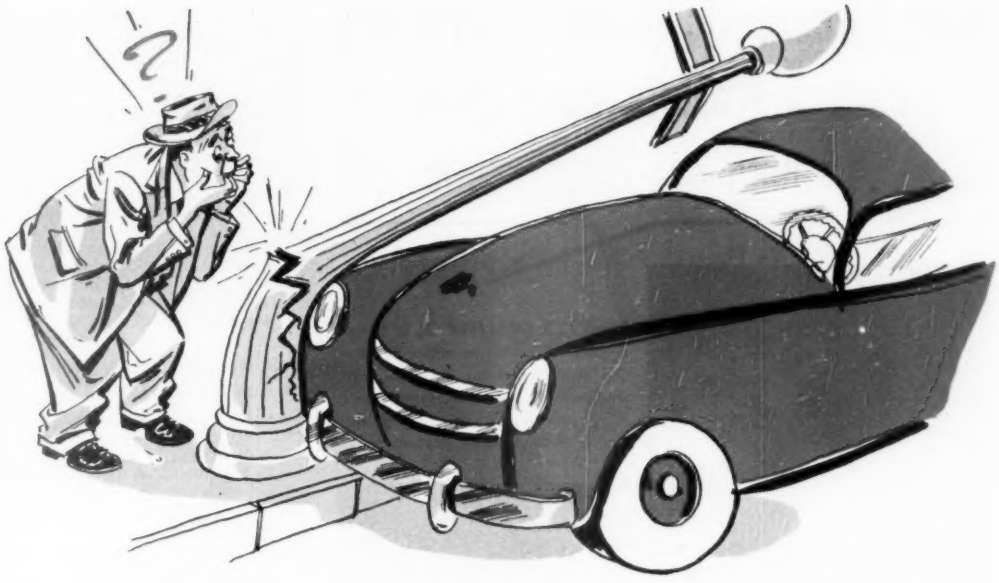
Chairman of the Thursday afternoon session was W. H. Bruckner, assistant research professor, University of Illinois, Urbana, Ill. Economy in welding and design was the subject of the first address, given by L. S. McPhee, Whiting Corp., Harvey, Ill. He emphasized the importance of cooperation between management, fabrication and design functions in a plant. Too many designers, he said, do not know the methods and tools available.

The responsibility of management for "engineering changes" was also stressed by W. R. Plummer, Progressive Welder Co., Detroit, in his talk, "Resistance Welding in the Management of Design and Production." Many times decisions are made as to final shape or size without consulting the men who will have to resistance weld the part, he said.

Last session presented was a group effort by three men: H. L. O'Brien and A. L. Meyer of Graver Tank and Mfg. Co. and G. K. Cooper, Purdue University. It involved a test set-up using SR-4 strain gages to show they may help solve welding problems.

The Weldor's Institute was held in the Purdue Fieldhouse. Two separate areas, each with bleachers, welding equipment, demonstration table and welding shields were provided for visitors. Demonstration-lessons were given at alternating hours for the gas and arc sessions so that everyone could attend if desired.

The following courses were taught during the two-day school: silver brazing, brazing of iron castings, die-cast welding, sheet and fender repair, small pipe fabri-



HAVE YOU A FRACTURE PROBLEM? DON'T WORRY—

WELD IT IN A HURRY WITH REVERE #456 BRONZE WELDING ROD

THE "FLAME-TESTED" ROD IN THE DISTINCTIVE RED, WHITE AND BLUE PACKAGE

The longer a piece of equipment is out of service the more it costs. You can cut this costly down-time by using Revere #456 Low Fuming Bronze Welding Rods for maintenance and repair jobs. They help you get equipment back into service faster because they save 3 ways:

1 **FASTER PREPARATION**—Time is saved in preparing the parts to be joined as the high strength of Revere #456 permits wide assembly tolerances, yet provides strong, neatly-finished joints.

2 **NO HIGH PRE-HEATS AND POST-HEATS**—You save on the time and fuel costs involved in preheating because the low melting point of Revere #456 (about 1600° F.) reduces the need for high preheats and post-heats.

3 **LESS "CLEAN-UP"**—Because it is low fuming Revere #456 enables you to get more accurate placement of the weld metal . . . saves on "clean-up" costs.

Next time you have a fracture problem in cast or malleable irons, wrought iron, cast or wrought steel, cast or wrought bronze, try Revere #456. Once you've worked with this "flame-tested" rod you'll see how it cuts costs, saves time and gives better results. Make Revere #456 prove itself. Order a package today.

Other Revere Welding Rods are: Revere Bronze 380, Manganese Bronze, Herculoy, Phosphor Bronzes, Brass (Brazing Rod), Silicon Deoxidized Copper and Electrolytic Copper. All come in 100-pound cases or in 25-pound cartons, net weight, and are stocked by Revere Welding Rod Distributors in all parts of the country. Write for folder giving technical data.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.
Sales Offices in Principal Cities. Distributors Everywhere.

New Aircomatic® Welding Process cuts materials cost 25% ... saves 4½ hours time

MARTIN QUAID CO., of Philadelphia, Pa., wanted to reduce the time and cost of welding huge stainless steel cylinders used in the manufacture of carpets . . . without affecting the quality of the finished product.

Dana V. Wilcox, Airco Technical Service Specialist, was called in. He recommended the use of Airco's new Aircomatic process. The cylinder to be welded was 13' 4" long with an O.D. of 34¾", and a wall thickness of .093 Type 304 stainless steel. After establishing the wire speed to be used in the Aircomatic process, the weld was performed in a total elapsed time of 1½ hours – 4½ hours faster than the former method used.

The operation consumed 6½ pounds of Airco Type 316 stainless steel wire, and 35 c.f.h. of Airco high quality inert gas – all at 25% below the cost of materials used in the old procedure. The customer was well satisfied and now uses the Aircomatic process for fabricating stainless steel as well as aluminum.

If you are interested in applying the Aircomatic process to a particular aluminum, aluminum or silicon bronze, stainless or nickel clad steel fabrication problem of your own, we will be glad to offer technical assistance. If you would like to receive a descriptive bulletin on Aircomatic welding, please write your nearest Airco office for a copy of ADC-661A.

AIRCO **AIR REDUCTION**

Offices in Principal Cities

TECHNICAL SALES SERVICE – ANOTHER AIRCO PLUS-VALUE FOR CUSTOMERS

cation, cast iron welding, flame cutting, powder cutting of stainless, arc welding stainless, overhead welding, pipe welding, low-hydrogen electrode welding, inert-arc welding, submerged-melt welding.

Individual instructors were: George H. Laws, Ruckman & Hansen, Inc.; V. A. Henry, Bendix Corp.; Virgil E. Lee, Smith Welding Equipment Co.; J. W. Carrier, Linde Air Products Co.; C. A. Heffernon, Linde Air Products Co.; Bob Bercaw, Hobart Bros. Co.; M. A. Teter, Linde Air Products Co.

Companies furnishing instructors were: All-State Welding Alloys Co., Inc.; National Cylinder Gas Co., General Electric Co., J. C. Menzies & Co., Lincoln Electric Co. and Air Reduction Sales Co.

* * *

Talk Non-Destructive Testing At June ASTM Meeting

TO ACQUAINT engineers and management with the advantages and uses of non-destructive testing, a special symposium will be held June 27 at Atlantic City. The one-day conference is sponsored by the American Society for Testing Materials, Committee E-7, and will be held during the Society's annual meeting.

One of the six papers will deal with weldments inspection, others on wrought products, castings, etc. The papers will survey all present methods, including radiography, ultrasonics, magnetic-particle and liquid-penetrant inspection and magnetic analysis.

Chairman of the conference is H. H. Lester, of Watertown Arsenal. The speakers are: R. C. McMaster, Battelle Memorial Institute; Kent R. Van Horn, Aluminum of America; J. Juppenlatz, Lebanon Steel Foundry; W. L. Schwinn, Babcock & Wilcox Co.; C. D. Moriarity, General Electric Co., and L. W. Ball, U. S. Naval Ordnance Laboratory.

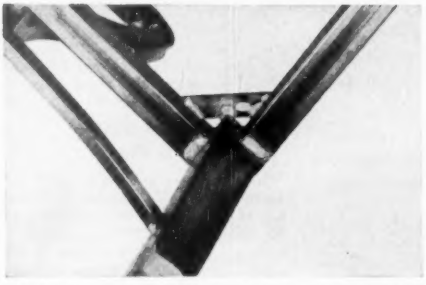
* * *

TROPHY AWARDED the Detroit Section of the American Welding Society for winning the intersectional competition at the "Quiz the Experts" program, an annual event. Teams from Detroit, Niagara Frontier, Anthony Wayne and the Indiana sections competed. The trophy was donated by Walter Anderson of Denton and Anderson Co.

56 welds in 25 minutes!

Note smooth weld surfaces. Practically no finishing needed before painting.

No wonder they use ANACONDA 997 Low Fuming Bronze Welding Rod!



Steel chair oxyacetylene braze-welded by vapor flux method with ANACONDA *997 Low Fuming Bronze Welding Rod. Total welding time, per chair, 25 minutes. Total welds per chair, 56—or less than ½ minute per weld. Courtesy: Metal Office Furniture Company, Grand Rapids, Mich., and Purity Cylinder Gases, Inc., Grand Rapids, an* ANACONDA *Welding Rod Distributor.* ANACONDA *Welding Rods are available from distributors throughout the United States.*

When you figure cost-per-joint, finished and ready to paint, you can't beat ANACONDA 997 Low Fuming Bronze Welding Rod. That's why the Metal Office Furniture Company, Grand Rapids, Mich., uses only "997" in braze-welding their "STEELCASE" furniture assemblies.

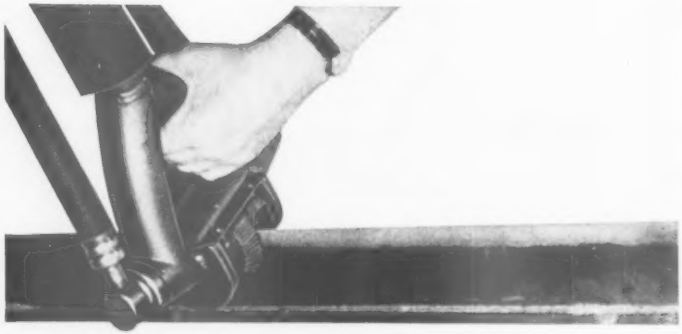
Used with an acetylene torch and vapor flux, the bronze readily tins the steel, feathers out nicely to form flat beads or smoothly rounded fillets. Every joint is dependably strong — and ready for painting with practically no finishing. With vapor fluxing there's no excess flux to remove.

The low-fuming characteristics of ANACONDA 997 Welding Rod permit faster welds and clean finished work. Insist that your supplier furnish you with genuine ANACONDA 997 Rod. If he can't, tell us. Please address The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

you can depend on ANACONDA® BRONZE WELDING RODS

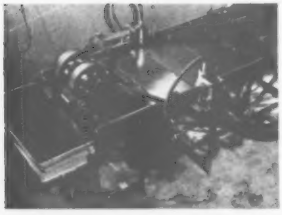
EDGE CLEANING STEEL PLATE

as fast as you can weld it



HIGH SPEED WELDING

with no weld porosity

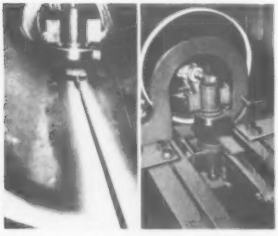


"A strip along both edges (top and bottom) and the thickness of steel sheet are cleaned to bright finish at high speed. Fully automatic."

Amazing new Vacu-Blast equipment makes high-speed welding vastly more efficient. Uses and re-uses crushed steel or other abrasive to clean metal surfaces to bright, dry, dust-free finish. Eliminates weld porosity caused by gas resulting from rust and scale. Clean contact prohibits electrode arcing. Makes possible a perfect weld seam at high speed.

Manufacturers of steel drums, pails and heavy steel pipe have eliminated "leakers" 100% and have cut labor costs on welding time by as much as 50%.

Get complete information now. See how Vacu-Blaster can improve your production line welding—cut your costs.



"Edge cleaning after rolling (left) and cleaning inner and outer periphery and end of steel cylinder (right)."

VACU BLASTER

2895

VACU-BLAST COMPANY, INC.

355 Peninsular Avenue • San Mateo, California

Pittsburgh Stages Welding Conference

THE THIRTEENTH annual Tri-State Welding Conference, held April 28 in Pittsburgh, was an impressive affair that included an annual banquet and ladies' night. It was sponsored by the Pittsburgh section of the American Welding Society and the Engineers' Society of Western Pennsylvania.

Speakers at the afternoon technical session were John B. Tinnon, vice-president, Metal & Thermit Corp., New York City, and T. B. Jefferson, editor of THE WELDING ENGINEER. Mr. Tinnon spoke about welding in business, and Mr. Jefferson discussed what the future holds for welding. The session was held in the auditorium of the Mellon Institute of Industrial Research.

The annual dinner and ladies' night was at 7 p. m. in the evening at the Hotel Webster Hall. Among the visiting VIP's were: O. B. J. Fraser, president, American Welding Society, M. W. Reed, president, Engineers' Society of Western Pennsylvania; Fred L. Plummer, district vice-president, AWS; J. G. Magrath, executive secretary, AWS and William Spraragen, editor, *The Welding Journal*, AWS.

Scott McKeever, inspection manager, Pittsburgh Testing Lab., Pittsburgh, was the lucky winner of the grand door prize.

* * *

Gets Cigar Box for 50-Year Service

HANDY & HARMAN, New York City, producer of silver-brazing alloys, recently honored its president, G. H. Niemeyer, for 50 years of service. Mr. Niemeyer was given a handwrought gold cigar box lined in mother-of-pearl, with a portrait medallion of his head on the cover.

The cigar-smoking president joined the company as an office boy on May 1, 1900. He became the firm's first salesman in 1902 and rose to president in 1938 via the successive offices of sales manager and vice-president in charge of sales.

* * *

Baltimore Sun Builds Welded Steel Plant

WHEN the new publishing plant for the *Baltimore Sun* is completed, it will be one of the largest welded structures erected in recent years. The six-story high building will have a floor area of 325,000 sq ft and contain 2,200 tons of steel. It was designed by Van Rensselaer P. Saxe, Baltimore consulting engineer.

Bids were asked for both riveting and welding, but welding was finally chosen because of the steel tonnage saved. The continuously-welded structure uses shallower beams that offer savings in dead weight. Other advantages are less fireproofing, smaller story heights and absence of noise during construction.

Sixteen 400-amp welders are needed to do this big job. E-6010 3/16-in. electrodes are used on all joints, 90% of which are in the vertical-up position. Average speed of metal deposit per operator is 17 to 20 lb per day, according to The Lincoln Electric Co. With root openings of 3/8-in. or less only one pass is required.

PAGE *Welding* ELECTRODES

a NEW line of Page-Allegheny AC-DC Stainless Steel Electrodes

ANOTHER STEP FORWARD IN WELDING STAINLESS!

they're NEW

...BUT they've been "given the works" by many large fabricators of stainless steel equipment—on the job. And, from all reports, they're the most all 'round satisfactory electrodes PAGE ever developed for any kind of weld on any type of stainless steel. And PAGE has been making stainless steel electrodes since the early development of stainless.

Ask your Page distributor about these new, improved Stainless Steel Electrodes

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Get in touch with your PAGE Distributor

Announcing THE BETTER AND MORE VERSATILE CYC-ARC STUD WELDER
REG. TRADE MARK

THE ONLY STUD WELDER THAT

- Welds ALUMINUM without gas and, with the same Tool, Brass, Monel, Mild and Stainless Steel.
- Speeds production — illustration shows ¾" diameter Steel studs welded one a minute.
- Cuts costs — low priced CYC-ARC studs —standard or tailor-made.
- Is chosen for construction of Britain's new Railway Passenger Cars, Naval Vessels and Atomic Energy Plants.

CYC-ARC LTD
REG. TRADE MARK
STELMAR HOUSE, 27 NEW NORTH RD.
LONDON, N.1, ENGLAND

CYC-ARC - 30 YEARS' SATISFACTION IN STUD WELDING EQUIPMENT

Cut out this coupon and mail today with your business letterhead
CYC-ARC LTD. (STUD WELDERS)
STELMAR HOUSE, 27 NEW NORTH ROAD, LONDON, N.1, ENGLAND
PLEASE SEND ME ADDITIONAL INFORMATION SHOWING HOW CYC-ARC WELDING CUTS PRODUCTION COSTS.

Bridge Builders Praise Welded Steel Structures

WELDING as a construction method received laurels at the American Institute of Steel Construction's second annual engineering conference. Cleanness of line and overall beauty of modern steel bridges is due to welded construction, said Ernest E. Howard, president, Howard, Needles, Tammen & Bergendoff, Kansas City, Mo. Mr. Howard's firm has won many prizes for beautiful bridges.

Economy and strength are realized from welded detail connections, declared La Motte T. Grover, welding engineer, Air Reduction Sales Co., New York City. The necessary smoothness of contour and strength of design in supersonic and subsonic wind tunnels is achieved by welding, said J. O. Jackson, Pittsburgh-Des Moines Steel Co., Pittsburgh.

The conference was held at Chicago's La Salle Hotel, April 12 and 13. Its attendance was more than double that of last year, according to convention officials. Some 210 members were registered, including visitors from both coasts and Canada.

Much interest was displayed in every talk presented at the meeting. Mr. Howard's talk on the beauty of bridge construction traced the feeling for beautiful design from the Egyptian, Roman, Greek and Renaissance periods. He said that beautiful bridges cost little more to construct but usually require more thought and more drawings than ordinary bridges.

Mr. Grover reminded his audience that some European builders have used experimental designs on welded details, but such data is not always applicable for us. Reason is that their steel is different (lower notch toughness) and their cost conditions vary widely. Special rolled shapes for welded construction have been talked about for a long time, but no one has yet really done much about it. The Germans produced girders with special flange sections, but discontinued them.

Some bridge designers specify too much welding, in the opinion of Mr. Grover With the cost of weld metal (including labor, beveling, etc.), as much as 150 times as expensive as steel, it behooves the designer to specify only necessary welds.

In beam and column practice, Mr. Grover pointed out, designers still use some sort of connection material, as a carryover from riveting days. Direct welds from beam to column are being used in newer buildings and serve satisfactorily.

* * *

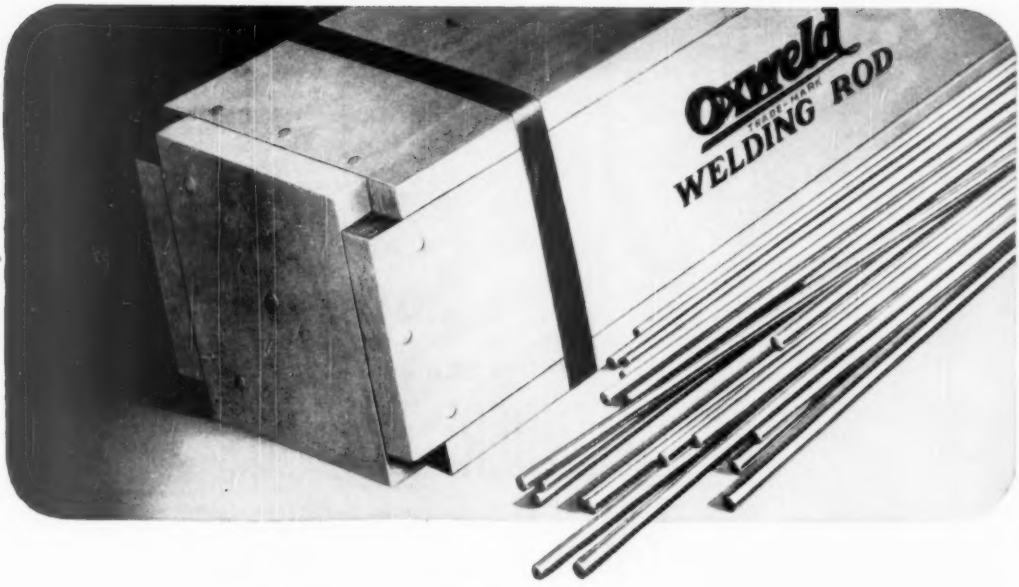
Distributor Appointments

AIR REDUCTION SALES CO., New York City: The Wright Welding Supply, Des Moines, Ia., for Carroll, Greene, Boone, Marion and Warren counties.

* * *

THE ANTI-BORAX CO., Fort Wayne, Ind.: The Cuba Cylinder Gas Co., Cuba, N. Y., will handle Anti-Borax low temperature welding compounds and fluxes.

* * *



How "OXWELD" Rods Reduce Welding Costs

Trade-Mark

You use less rod per weld, because OXWELD Rods produce high-strength welds with minimum reinforcement. OXWELD No. 1 H. T. Rod, for example, has a tensile strength 11,000 lb. per sq. in. higher than any ordinary steel rod—enough *extra strength* to permit reduction of the amount of weld metal on a job, with substantial saving of gases and labor.

You weld easier and faster—saving both time and gases—because all formulas for OXWELD Rods are worked out to give highest weldability as well as best possible physical properties in finished welds.

You get better welds at lower finishing costs, because welds made with OXWELD Rods are always of uniform high quality, strength, and ductility—easy to machine and finish without excessive labor.

You need fewer types of rods to handle your complete range of welding. Five OXWELD Rods—No. 1 H. T. Steel, No. 7 Drawn Iron, No. 25M Bronze, No. 23 Aluminum, and No. 9 Cast Iron—are sufficient for all average fusion welding, braze-welding, and bronze-surfacing. For the less frequent jobs of specialized nature, there are 9 additional welding rods and 8 hard-facing rods—all available from the same source.

The term "Oxweld" is a registered trade-mark of Union Carbide and Carbon Corporation.

Look for the **Oxweld** Trade-Mark on the rod or on the box

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N.Y.

Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

REGO

HIGH PRESSURE
CYLINDER
VALVES

for OXYGEN and HYDROGEN

Designed, tested and proved for high pressures and severe service.

Packing may be replaced with cylinder under pressure if necessary.

Fuse plug and bursting disc provide positive safeguard.

Bronze stem furnished as standard, also available with monel stem on special order.

for ACETYLENE

Cadmium-plated steel stem with monel tip resists rust and wear.

Ball-nose seat construction assures positive shut-off.

for CARBON DIOXIDE

Available with diaphragm-type or packed-type construction.

Compact rugged design for use with high pressures.

Equipped with bursting disc safety device.

*Reg. U. S. Pat. Off.

The BASTIAN-BLESSING Co.
4201 West Peterson Ave. Chicago 30, Illinois

PIONEER AND LEADER IN THE DESIGN AND MANUFACTURE OF PRECISION EQUIPMENT FOR USING AND CONTROLLING HIGH PRESSURE GASES

Robinson Welding Supply Appointed Linde Distributor

LINDE welding apparatus, oxygen and acetylene will be handled on the west side of Detroit by the Robinson Welding Supply Co. This firm has just been made a full Linde distributor. By taking over the Linde distributorship for Detroit's west side, Robinson has absorbed the gas business of the Northwest Welding Supply Company and the west branch of Welding Gas & Equipment Co.

Robinson Welding Supply started its business in 1937 as a distributor of arc welders and accessories. Gradually, additional lines of hard-facing materials, acetylene welding apparatus and other accessories were acquired. In 1946 the company built its present 63 by 100 ft. building at the corner of Wisconsin and Lyndon Avenue, Detroit. In 1949, it expanded by taking over the welding supply division of Dix Engineering Co., Detroit.

Officers of the firm are: J. M. Robinson, president and treasurer; Elizabeth S. Robinson, vice-president and Olga Richards, secretary.

For the last several years Robinson Welding Supply has enjoyed an annual volume of between $325,000 and $425,000. With the new distributorship, volume may reach $500,000, Mr. Robinson estimates.

* * *

Houston Distributor Moves to New Building

ACME Welding Supply Inc., Houston 6, Tex., occupied its new 100 ft building at 2704 Brazos St. on May 1. The new facilities include a steel building with transite covering, a loading dock for cylinders and off-the-street parking space.

The firm has been incorporated with the following officers: Howard R. Proctor, Mrs. Howard R. Proctor, William G. Speer and Mrs. William G. Speer. A division known as Acme Medical Gases, Inc., will be set up to handle medical oxygen and other gases. Jimmie F. Hury will direct the latter operation.

Acme has been a Linde reseller since 1932. Since that year, they have built up a 10,000 cu ft per month business into a 500,000 cu ft per month volume. Welding equipment, electric tools, electrodes and industrial supplies are also carried. Four trucks deliver Acme supplies in Houston; another truck operates on a route extending as far as 150 miles from the city.

Mr. Proctor, the president, was one of the pioneer members of the National Welding Supply Association and is just completing three years as vice-president of the Southwest district.

* * *

St. Louis Distributor Changes Firm Name

MCDONALD AND WILSON SALES CO. is the new name of the firm formerly known as the Harris Calorific Sales Co., 4924 North Broadway, St. Louis 7. Address and phone remain the same, and the same lines of welding equipment and supplies and industrial equipment will be handled.

Rewarding work!

NI-ROD saves iron castings...makes *machinable* welds

But for Ni-Rod electrodes, this pump body would have been scrapped at the foundry. The built-up area of the flange facing is almost indistinguishable from the original cast iron. Machining, drilling and tapping of the Ni-Rod weld deposit were no more difficult than similar operations in cast iron.

In the photograph above, you see a 45-pound gray iron pump casing that was rejected because a small area of the flange failed to fill during pouring.

Instead of being scrapped, the casting was sent to the plant's welding department. There, with Ni-Rod® electrodes, the defective flange was built up and the repaired casting was passed to the machine shop where it was finished like a regular production piece.

Salvage operations like this with Ni-Rod save time and money.

Ni-Rod gives fast, crack-free, non-porous welds that are a close color match for gray iron . . . and welds that are as *machinable* as the iron itself. Slag removal is easy. And Ni-Rod is stable-arcing in all positions with either AC or DC current.

Another important Ni-Rod feature . . . preheating or post-heating is seldom necessary.

Why not try Ni-Rod in your own shop . . . soon? Discover for yourself why *4 out of 5 shops* re-order Ni-Rod, once they've tried it.

Your nearest INCO distributor stocks Ni-Rod in 3/32", 1/8", 5/32", and 3/16" diameters.

FREE – 8-page booklet:
"NI-ROD . . . a new electrode for any cast iron welding."

For welds you've never been able to make before . . . in high-phosphorus irons; heavy sections—

NI-ROD "55"

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

EMBLEM OF SERVICE
INCO NI-ROD TRADE MARK

***NI-ROD* DISTRIBUTORS**

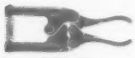
Alloy Metal Sales, Ltd.	J. M. Tull Metal & Supply Company	Whitehead Metal Products Company, Inc.
Robert W. Bartram, Ltd.	Pacific Metals Company, Ltd.	Wilkinson Company, Ltd.
Eagle Metals Company	Steel Sales Corporation	Williams and Company
Metal Goods Corporation		
Metal & Thermit Corporation	**National Cylinder Gas Company**	**Hollup Corporation**

For Quick, Efficient On-Location Clamping Use Knu-Vise Portable Vises

P-400

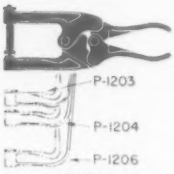
For clamping when space is limited

Equipped with various spindle types—steel or copper, or rubber capped



FGP-400

Spindle automatically adjusts itself to total thickness of materials held



P-1200

Available in 4 standard throat gaps—1½", 2⅛", 3½" and 6"

Whether you clamp tiny parts requiring pressures of a few pounds or want to hold together huge assemblies that need pressures of around 1800 pounds, Knu-Vise Toggle-action pliers will provide the dependable service you need.

Made to most exacting specifications resulting from exhaustive laboratory tests and years of practical use among leading industries.

Models with special throat gap or throat depth, special anvils and spindles, on request.

Ask for complete catalog

Consult us direct or our representative engineer near you

Buffalo, N. Y., J. H. England
Chicago 20, Ill., Larry P. Wood
Columbus, Ohio, Arthur Gangloff
Dallas, Texas, C. G. Wilson Co.
Dayton 2, Ohio, W. F. Grimes
Detroit 2, Mich., 2906 W. Grand Blvd.
Glendale, Calif., Art Lewis Prod. Equip. Co.
Houston, Texas, L. H. Creasy
Indianapolis, Ind., E. M. Lewis
Kansas City, Kansas, L. N. Wood
Milwaukee 9, Wis., K. W. Stoffregen
New York 17, New York, V. A. Chorn
Oakland, Calif., Bues Prod. Equip. Co.
Philadelphia, Penn., Jackson-Walter Company
Seattle, Washington, Norwes Company
St. Louis, Mo., Moehlenpah Engr., Inc.
Warren, Ohio, P. L. Durr

KNU-VISE PRODUCTS

LAPEER MANUFACTURING CO.
3056 DAVISON ROAD • LAPEER, MICHIGAN

SAVE! TIME AND MONEY

SPEEDY LAYOUT JOBS ON PIPE AND STRUCTURAL STEEL

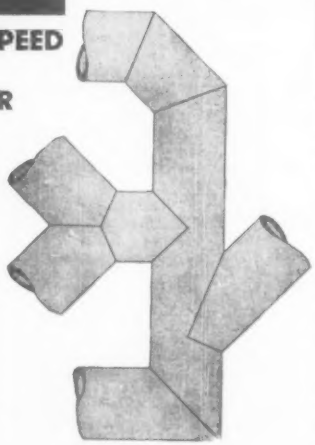
NOW! NEW EASE AND SPEED WITH THE CONTOUR MARKER

Compact, fits into hip pocket. Efficient, accurate, easy to use. Any of the angles in the illustration to the right can be marked off in five minutes or less on any pipe from 1½ to 18 inches. Saves time, labor and gas—will pay for itself in one day.

IF YOUR LOCAL DISTRIBUTOR CANNOT SUPPLY YOU CAN ORDER DIRECT.

TO: CONTOUR MARKER CORP.
1843 E. Compton Blvd.
Compton, Calif.
Please send me full details on the Contour Marker.

NAME .....
COMPANY .....
STREET .....
CITY .....



J. M. Tull Metal Show Draws Big Crowds

STEADY streams of delegates and visitors saw all activities of the three-day J. M. Tull Metal & Supply Co. show and welding clinic at Atlanta, Ga., April 13-15. This was the largest show of its type ever held in the Southeast, according to Tull officials. The success reflects the industrialization of the area in recent years.

Crowds witnessing demonstrations of new welding equipment were so large that time schedules had to be arranged. Among new equipment shown were flame-cutting machines, automatic inert-arc metal-arc processes, silver brazing fittings and controls for oxy-acetylene torches.

The clinic and demonstrations were held in the new million-dollar Tull warehouse. Many visitors brought special problems in welding to be solved by Tull employees or by the exhibitors.

* * *

Deadline July 31 for RWMA Papers

IF you are planning on writing a paper for the Resistance Welder Manufacturers Association annual prize contest, remember that it must be in by July 31. Send it to the American Welding Society, 33 W. 39th St., New York City 18.

As before, prizes totalling $2,250 will be awarded. First prize of $750 will be given for the best paper from an industrial source, consulting engineer or government or private laboratory.

Second prize in this classification is $500 and $250 will be given for third place.

The best paper from an educational or university source will receive $300; the second-best paper in this category, $200. A special prize of $250 will be made to an under-graduate who writes the best paper on resistance welding.

The five-man jury of award: W. E. Crawford, A. O. Smith Corp., Milwaukee, chairman; W. E. Smith, Midland Steel Products Co., Detroit; R. M. Wilson, The International Nickel Co., Inc., New York City; B. L. Wise, National Electric Welding Machine Co., Bay City, Mich.; Professor R. A. Wyant, department of metallurgical engineering, Rensselaer Polytechnic Institute, Troy, N. Y.

* * *

Karma Mfg. Co. Makes Spot Welders

SMALL portable spot welders are in production and have been for some months at the Karma Mfg. Co., 14823 Loomis St., Harvey, Ill. The firm is the former Alcasco Foundry & Mfg. Co.

Arthur O. Backen is president and chairman of the board of directors; Fred Klavitter, secretary-treasurer and V. Amato, vice-president. Mr. Backen supervises sales and manufacturing activities.

Fenders, turret tops, etc., on new automobiles are especially adapted to repair and remodeling with the new portable spot welder, according to Mr. Backen. Other uses are being found in the refrigeration, heating and furnishings industries.

At present, Karma is open to jobbing offers to serve the industrial field.

Build Freight Cars For Lease to Railroads

THE Pullman-Standard Car Mfg. Co. is now working on an order for 1,300 welded freight cars. These are financed by the Equitable Life Assurance Society which will lease them to the Atlantic Coast Line. Of the total, 600 are covered hoppers and 700 are pulpwood cars.

A second order for 1,500 box cars, to be leased to the New York Central, was also being negotiated. Under the Equitable proposal, railroads may lease cars for 15 years, with an option to continue afterwards at a lower rental. No down payment is required, a feature that is expected to encourage many railroads to modernize their equipment.

* * *

Plant at Orange, Tex., Begins Making 30-in. Pipe

PRODUCTION of 30-in. diameter pipe has begun at Consolidated Western Steel Corporation's new large diameter pipe mill at Orange, Tex. Final adjustments and testing of machinery and equipment were completed in April. At peak production, the mill will turn out about 50 miles per month of submerged-melt-welded piping.

* * *

Dravo Purchases Piping Plant

DRAVO CORP., Pittsburgh, Pa., has purchased the pipe-fabricating plant at Marietta, O., formerly owned by International Derrick Co. The property consists of two manufacturing buildings, storage yards and an office. Altogether there are 93,000 sq ft floor space.

* * *

Appointed Agent for Electrode Coating

MILLMASTER CHEMICAL CORP., New York City, has been appointed exclusive agent for the sale of "Wollastonite," a calcium metasilicate that is used in electrode coatings. Other uses are in paint pigments, glass, floor tiles and insecticides.

"Something might break down on our honeymoon!"

BECKER

A complete line of Welding Brushes for ALL types and makes of Welding Equipment — Keen-Arc Carbons (illustrated) for twin-arc torches—carbon and graphite welding electrodes — carbon rods, plates and paste — a complete line of replacement brushes for all motors and generators . . . plus the facilities and engineering staff to produce any electrical or mechanical carbons to your specifications. Write for catalogs.

BECKER BROTHERS CARBON CO.
3450 S. 52nd Ave. • CICERO 50, ILL.

CARBON

National
Carbide

EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY

NATIONAL CARBIDE IN THE RED DRUM
Write us for information as to nearest available stock.

NATIONAL CARBIDE COMPANY
A Division of Air Reduction Company, Inc.
60 E. 42nd St., New York 17, N. Y.

IMPORTANT

NEW USES

MEAN THAT YOU CAN

SAVE MONEY

WITH

3 in 1 "York's 77"

SPECIAL FLUX

FOR...

GENERAL BRAZING

CAST IRON WELDING

CAST IRON BRAZING

NO NEED TO STOCK
3 DIFFERENT FLUXES
WHICH DETERIORATE
WHEN ONE CAN OF

"York's 77" 3 in 1 FLUX

MEETS ALL YOUR NEEDS

Make full use of the 4 famous features of "York's 77".

You will save money, save labor, and save time.

1 Fear of overheating can be forgotten.

2 Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.

3 Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.

4 Deteriorated cast iron can always be welded successfully with "York's 77".

YORK ENGINEERING COMPANY 3349 OGDEN AVENUE CHICAGO 14, ILLINOIS

Courtesy Ideal Mobili Co., Detroit, Mich.

for Model Kitchens!

Six versatile De-Sta-Co Toggle Clamps save in this simple, economical, plastics cementing fixture. The turntable more than doubles production . . . eliminates the cementing cycle "bottleneck."

These perfect reproductions are for a manufacturer of metal kitchens. This operation, cementing on tops, requires: Fast cementing cycle—positive clamping pressure for a perfect bond—precise alignment for accurate assembly.

De-Sta-Co No. 225-U fills these requirements. *Completely retractable* when opened for quick insertion and removal of work, it offers the rapid toggle action, positive holding pressure and accurate performance that make De-Sta-Co Toggle Clamps *ideal* "Model Tooling".

For *your* working-holding problems in Assembly, Welding, Bonding, Machining, Inspection . . . of any materials . . . tool up with these economical, efficient, high-production examples of "Model Tooling".

De-Sta-Co Toggle Clamp Catalog describes more than forty stationary and portable clamps. Write for your free copy today.

DETROIT STAMPING CO.

372 Midland Ave. • • Detroit 3, Mich.

NEW PRODUCTS

(Continued from page 46)

Flexible Tubing for Fume Removal

LIGHTWEIGHT flexible tubing for fume removal units is claimed to be highly wear-and-heat resistant. It is constructed of rustproof spirally wound spring steel, covered inside and out by double-seam stitched cotton duck, and then coated with Neoprene.

Available in a variety of standard plies and materials, this new flexible tubing is designed to satisfy ducting requirements from 3 to 30 in.

It is named "Spiratube" because of its construction.

THE FLEXIBLE TUBING CORP., Branford, Conn.

• • •

Belt-Sander Changes To 6-in. Portable Saw

NEW 4-in. belt sander, the Cummins Model 650, quickly converts into a 6-in. portable saw. The belt is held under constant spring pressure and is said to center perfectly on the pulleys. Alignment of the belt is adjusted by a small knob at the left rear of the sander. A tension latch provides for quick change of the belt. Weight of the sander-saw is 18 lb.

CUMMINS PORTABLE TOOLS, DIVISION OF CUMMINS BUSINESS MACHINE CORP., 4740 Ravenswood Ave., Chicago 40.

• • •

NEW PRODUCTS BRIEFS

A NEW "try-it-for-size" kit of eleven different spring-coil clamps offers a range of clamping pressures from 5 oz. to 18 lb. Maximum openings range from 3¼ to 20 in. The clamps are useful in jigs for welding and brazing.

HUNTER SPRING CO., 1 Spring Ave., Lansdale, Pa.

• • •

NEW HARD solder for joining aluminum to steel, bronze, copper and aluminum is known as "EutecRod 192." It is available in coil form in 1/16, 3/32 and 1/8 in. diameters.

EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York City 13.

About People

A. D. FREEMAN has been appointed sales manager of Industrial Air Products Co.; Portland, Ore. He will direct both sales and promotion for the Portland and Medford, Ore., offices and Spokane, Wash. He was formerly vice-president of the Valley Oxygen Co.

* * *

FRANK C. JONES has been elected to the board of directors of Handy & Harman, New York City. THOMAS G. MCMAHON, formerly a director, has resigned. JUDSON C. TRAVIS was elected executive vice-president by the board. HOWARD W. BOYNTON will be vice-president and treasurer. ROBERT H. LEACH will continue as vice-president, consultant and advisor in production and research matters. JOHN W. COLGAN will be vice-president and sales manager. RICHARD G. JONES was elected secretary and will continue as controller of Handy & Harman.

* * *

EDWIN F. BATES, formerly manager of the Red Lion plant of The Budd Co. has been appointed manager of the company's Chase Plant, now being built at Gary, Ind. LEE N. BLUGERMAN has taken over management of the Red Lion plant.

* * *

WARREN L. SMITH, former senior vice-president, has been elected president of The M. W. Kellogg Co., Jersey City and New York City. HAROLD R. AUSTIN, former president, is retiring after 47 years with the company.

* * *

MORGAN H. POTTER has been elected vice-president in charge of sales of Marquette Mfg. Co., Minneapolis. He has served as welding clinic specialist, head of sales training and sales manager.

* * *

J. W. BROOKS has joined the welding engineering staff of The Lincoln Electric Co. in the Boston area. J. J. CHEMERYS is serving accounts in the Syracuse, N. Y., territory. W. R. KARLL is doing sales and engineering in the Newark, N. J., office. R. G. TODD has joined the engineering staff of the Tulsa, Okla., office.

* * *

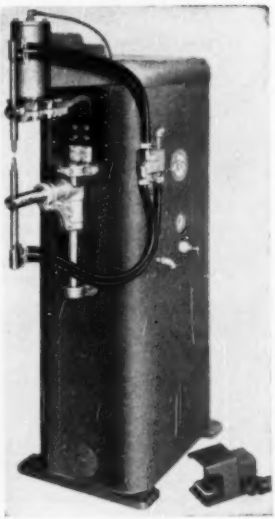
BERNARD E. DAVID has joined Arcos Corp., Philadelphia, as a special field engineer with the company's Los Angeles offices. WALTER G. LIST acts as field engineer in the Ohio-western Pennsylvania area with Williams & Co., Inc., Pittsburgh. J. J. SCHLASS will work in the Philadelphia district. All three men have had extensive welding experience over large areas of the country.

* * *

GEORGE R. HUFFMAN has been named advertising manager of E. D. Bullard Co., San Francisco manufacturers of safety equipment. E. W. BULLARD, JR., has been named assistant to the vice-president in charge of sales.

Banner 15 KVA SPOT WELDER

- High Speed—Quality Production
- Simple—Rugged Construction
- Easy Maintenance



Typical of the many advantages of Banner Spot Welders is the unique head construction of the unit illustrated. A rugged aluminum-bronze piston, with long bearing surface, is equipped with 3 cast iron piston rings which reduce friction to a minimum.

Special steel guide through the cylinder wall and piston prevents side play of the head—thus assuring clear uniform welds.

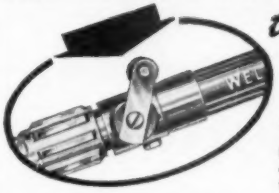
This air-operated, 15 KVA press type Spot Welder which is floor mounted, has many other distinctive features illustrated in booklet, **"Banner Welders and Brazers."**

BM Co

BANNER MANUFACTURING COMPANY

4936 NORTH 29TH STREET • MILWAUKEE 9, WISCONSIN

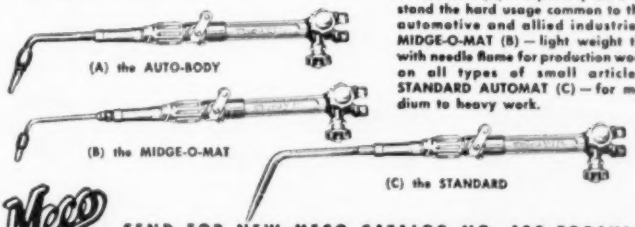
for Mass Production Welding there's no torch like the Meco AUTOMAT



The famous MECO "On-Off" Action (above) allows a tiny pilot light to burn at the tip with the action in the "off" position. At a touch it flashes to full production flame. Action tested over 200,000 times without appreciable sign of wear.

For mass production there is no such thing as a good all-round torch. Time and motion studies have proved that for efficient production welding, the torch used must be fitted to its particular job. The Meco AUTOMAT family — embodying the famous MECO "On-Off" action (oval), is perfectly suited to the start and stop welding so common to production. The importance of this time saving feature to mass production work is apparent. Beyond this, each member of this family has built-in features perfectly suiting it to its own particular class of welding.

AUTOBODY (A) — especially built to stand the hard usage common to the automotive and allied industries. MIDGE-O-MAT (B) — light weight tip with needle flame for production work on all types of small articles. STANDARD AUTOMAT (C) — for medium to heavy work.



Meco

SEND FOR NEW MECO CATALOG NO. 130 TODAY!

Modern Engineering CO., Inc.

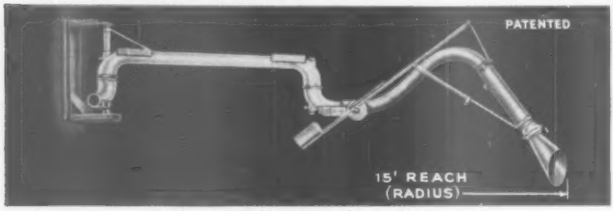
3411 PINE BLVD. ST. LOUIS 3, MO.

"Ruemelin Fume Collectors certainly have a powerful suction. We welders like them because they do a good job of taking away smoke and heat."

Long Reach Hinged Type Fume Collector Extends Working Range

Welding shops equipped with Ruemelin Fume Collectors enjoy a clean working atmosphere. Smoke, heat and gas are removed quickly and efficiently. Working conditions greatly improved . . . production increased. For the large welding booth, a long reach model (shown below) makes it easy to reach any welding job. 15 ft. and 18 ft. sizes. Available in wall type or underslung ceiling type brackets.

Portable models also available. Write for Fume Collector Bulletin 37-D.



Long reach hinged type fume collector

RUEMELIN MFG. CO.

MANUFACTURERS AND ENGINEERS
SAND BLAST AND DUST COLLECTING EQUIPMENT
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

Top Quality Welding Supplies— When and Where You Need Them!

Call U·S·S Supply Co.

● In all our warehouses—coast-to-coast—we have large stocks of welding supplies, including **Stainless Steel Electrodes, Mild Steel Electrodes** and **Hard-Surfacing Electrodes.**

Your orders for Welding Rod for electric arc welding and other welding supplies will be filled quickly. And we can also make immediate delivery on Welding Machines, Havens Protected "C" Clamps and Protect-O-Metal for eliminating weld spatter. Phone, write or wire our nearest warehouse.

WHEN YOU DEAL WITH US, YOU GET Service Plus!

UNITED STATES STEEL SUPPLY COMPANY

Warehouses and Sales Offices:
BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. · NEWARK · PITTSBURGH · PORTLAND, ORE. · SAN FRANCISCO · SEATTLE · ST. LOUIS · TWIN CITY (ST. PAUL)
Sales Offices: KANSAS CITY, MO. · PHILADELPHIA · ROCKLAND, ILL. · TOLEDO · TULSA · YOUNGSTOWN
Headquarters Offices: 208 S. La Salle St.—Chicago 4, Ill.

UNITED STATES STEEL

I. H. LEVIN has joined Independent Engineering Co., Inc., O'Fallon, Ill., as director of research and development. A pioneer in the compressed gas business, he worked abroad and in the United States on the early development of the production of oxygen and hydrogen by electrolysis. He organized the Electrolytic Oxy-Hydrogen Laboratories to further the development and manufacture of Levin Cells. From 1940 to 1949 he was technical director of Pascall Oxygen Co. and director of research for Fels and Co.

* * *

J. E. "EARL" TEMPLETON, manager of the Los Angeles branch of P. R. Mallory & Co., Inc., Indianapolis 6, Ind., has succeeded WALTER HARVEY as manager of the company's wholesale division. Mr. Harvey remained active with the company through May.

* * *

JOHN A. MENSTER has been appointed assistant manager of sales for the welded tube division of The Babcock & Wilcox Tube Co., Alliance, O.

* * *

FRANK L. BLODGETT has been appointed sales manager of the hard-surfacing division of the Alloy Rods Co., York, Pa.

* * *

TOM GILLESPIE, well known welding representative in the Midwest for many years, has come out of retirement to purchase the General Welding Products Co., Indianapolis, Ind. With his son he will actively direct its operation. He was one of the first organizers of the Purdue Welding Conference in 1927.

* * *

ALBERT E. Zeisel has resigned as vice-president and general sales manager of Eutectic Welding Alloys Corp., New York City.

* * *

WALTHER H. FELDMAN has been named vice-president in charge of sales for Worthington Pump and Machinery Corp., Harrison, N. J.

* * *

J. M. FLOYD, vice-president in charge of manufacturing for A. O. Smith Corp., Milwaukee has been named executive vice-president of the company. He will take over operating supervision of the company under the general direction of the president, W. C. Heath.

* * *

T. R. FARLEY, vice-president of Caterpillar Tractor Co., has been named general manager of Caterpillar's new plant to be located two miles southwest of Joliet, Ill.

Died . . .

WILLIAM M. LEVYN, 73, founder and former president of Acme Electric Welder Co., Vernon, Calif., died in March. His sons, Stanley and Robert, serve as president and secretary-treasurer of the firm.

* * *

JERAULD "JERRY" SYLVESTER FRENCH, director of publicity and public relations of The Bastian-Blessing Co., Chicago, died of a heart attack April 22. He was active in the promotion of RegO products and was a member of the Liquefied Petroleum Gas Association. He leaves his widow, Mildred.

"ANTI-BORAX"

LOW TEMPERATURE
WELDING
COMPOUNDS
and
FLUXES

•

Choose the One
Best Suited to Your Job . . .

- Cast Iron Welding Flux
- Brazing Flux for Brass, Bronze, etc.
- Brass, Bronze Welding Flux
- Flux for Bronze Welding Cast Iron
- Extra Quality Aluminum Flux
- Aluminum Flux
- Steel Flux
- Stainless Steel Flux
- Silver Solder Flux
- Tinning Compound
- Burnt Cast Iron Welding Flux
- Brazing Flux for Extruded Bronzes
- Special Brazing Flux for Aluminum Bronze, Everdur, and All Silicon Bronzes
- Special Flux for Magnesium Alloys, Dow Metal, etc.
- Silver Solder Paste Flux

Send for descriptive circulars and for **free sample.**

ANTI-BORAX COMPOUND CO., Inc.
FORT WAYNE, INDIANA

SHAWINIGAN
CARBIDE

SHAWINIGAN PRODUCTS CORPORATION
EMPIRE STATE BUILDING
NEW YORK 1, N. Y.

30 YEARS AGO

(From THE WELDING ENGINEER of June, 1920)

SHAWINIGAN PRODUCTS CORP., New York and Chicago, has recently taken over the business of the Canada Carbide Sales Co.

—30 YEARS AGO—

MARCH, 1920, was a heavy month for Thermit welding. More than 200,000 lb of Thermit mixture were ordered by steel mills, factories, railroads and shipyards.

—30 YEARS AGO—

FORMATION of a Chicago chapter of the American Welding Society was discussed by the society's past-president, Comfort A. Adams, on a recent visit. Plans were made for an organizational meeting in June.

—30 YEARS AGO—

WELDED 12- and 16-in. pipe line was recently laid through Montgomery and Delaware Counties, Pennsylvania. A story of the welding operations written by Prof. Alfred S. Kinsey, is carried in this issue of THE WELDING ENGINEER. The pipe line will carry by-product gas from coke ovens to homes in the area for lighting and heating.

—30 YEARS AGO—

SPECIAL portable grinders for cleaning overflow metal along the welding line have been brought out by The Van Dorn Electric Tool Company of Cleveland.

—30 YEARS AGO—

CHICAGO Local No. 301 of The Brotherhood of Gas & Electric Welders and Operators of America has been organized and is open to any welder living in Illinois. Charles H. Knight is the state organizer.

—30 YEARS AGO—

OFFICERS of the American Welding Society for 1920 will be J. H. Deppeler, president, J. W. Owens, vice-president (two years) and D. B. Rushmore, vice-president (one year).

—30 YEARS AGO—

THE Oxweld Acetylene Company, of Newark and Chicago, has begun work on a government contract calling for cutting up 4,000 tons of armor plate scrap. The plates had been pierced by heavy artillery shells during wartime tests at Sandy Hook.

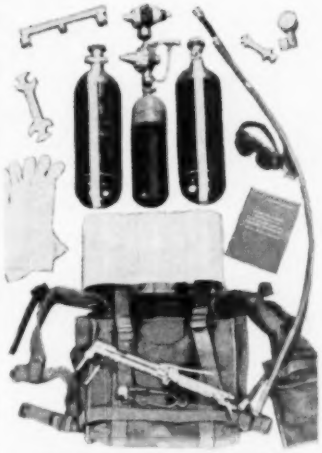
—30 YEARS AGO—

BARNEY OLDFIELD is pictured in this issue of THE WELDING ENGINEER using compressed oxygen to fill an Oldfield tire.

—30 YEARS AGO—

CLEAN, bare electrodes are more reliable than coated electrodes for such work as locomotive boilers, tanks, etc., say several letters to the editor this month.

—30 YEARS AGO—



Prices Slashed!
...limited quantity

***New* Oxygen Acetylene Portable Cutting Outfits**

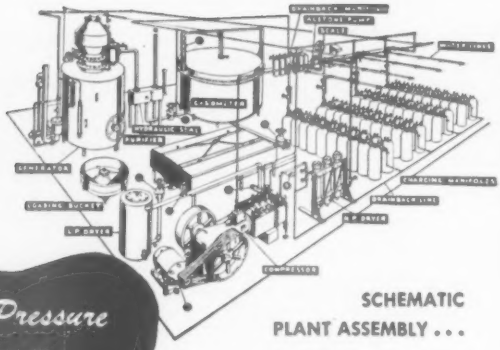
Regularly $159.00

Now $89.95

Manufactured by "Victor" and "National" . . . Includes: 4 Oxygen Cylinders, and 2 Acetylene Cylinders, Regulators, Two-Stage Reduction Oxygen Regulator (preset), Oxygen Cylinder Manifold, Gauge for Testing Oxygen Cylinder Content, Oxy-Acetylene Twin Hose with Couplings, Hand Cutting Torch with Cutting tip, Extra Cutting tip, Canvas Pack Treated for Flame Resistance, Shoulder Straps; one holds cutting torch the other holds accessory bag, Aluminum Cylinder Cradle, Necessary Wrenches, Acetylene Cylinder Valve Key, Spark Lighter, Leather Gloves, Protective Goggles, Instruction Manual.
Can be easily converted to combination outfit with addition of welding torch (J-27) $10.05 (add.); plus type J-19 Nozzle $3.15 and tips Nos. 0, 2, 4, at 65c each. Dealers' inquiries invited. Prices F.O.B.

INDUSTRIAL AIR PRODUCTS COMPANY, 3200 N.W. Yeon, Portland, Oregon, or 907 S. Peters St., New Orleans, Louisiana

INDUSTRIAL AIR PRODUCTS CO.
Portland, Oregon New Orleans, La.



A *Low Pressure*
ACETYLENE
PRODUCING
PLANT
that Charges up to
160 CYLINDERS
at ONE TIME

SCHEMATIC PLANT ASSEMBLY . . .
showing placement of the various units that comprise the plant.

This plant layout provides for *extremely* simple operation and exceptionally *low* maintenance costs. Ample storage space is also provided for filled tanks. Being compactly designed the chief operator has all operations under surveillence at all times. Rated capacity of this assembly is 2700 cu. ft. per hour.

We invite your inquiries

INDEPENDENT ENGINEERING COMPANY, Inc.
CONSULTING · RESEARCH · DESIGNING
Manufacturers of
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS

TINNENE
COMPOUND
TINS METALS FOR SOLDERING

A Tinning Compound that gives ECONOMY and EFFICIENCY

Fifteen Years of Customer Satisfaction

Solders any Metal
—including Aluminum—
using Ordinary Solder

TINNENE works fast and makes a bond that will not separate. Packed in large, open-mouthed containers for convenient use.

- **National Distribution**
- **Ask Your Jobber**
- **Send for Complete Facts**

REMONT MANUFACTURING COMPANY
LOMBARD, ILLINOIS

The Biggest THIEF in America

WHEREVER steel is handled in your plant, that big thief, RUST, is robbing you of production and profit.

Don't put up with this thievery! Oakite can help you arrest RUST by:

1. **Removing rust and grease in one operation**
2. **Preventing rust while parts are being processed**
3. **Cleaning and phosphating, with protection against rust before and after painting**

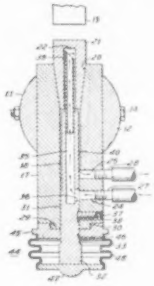
FREE For Anti-Rust Bulletin A-9839 write Oakite Products, Inc., 75 Thames Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE
Technical Service Representatives Located in Principal Cities of United States and Canada

From the Patent Office

R-W Electrode Holder

2,501,343. ERNEST M. LAUGHNER, Jeanette, Pa. Assigned to Westinghouse Electric Corp., East Pittsburgh, Pa. Filed July 26, 1947. Granted March 21, 1950.

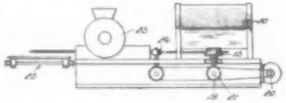


A new resistance welding electrode holder has a longitudinal bore with a tapered seat at one end to receive an electrode tip. It includes inlet and outlet connections with the bore for a cooling fluid. A striker is located in the bore, said striker having an opening through it for connecting with one of the cooling fluid conduits. Projecting from the conductive body at the other end is a ram for engaging the striker. A single resilient metal bellows member connects the ram to the body member.

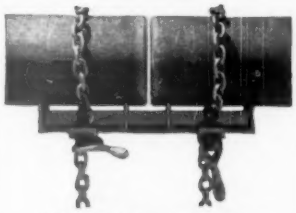
* * *

Electrode Coating Device

2,494,856. JOHANNES BERNARD ANINGA and JAN TENGER, Eindhoven, Netherlands. Assigned to Hartford National Bank and Trust Co., Hartford, Conn. Filed Feb. 6, 1947. Granted Jan. 17, 1950.



A newly patented apparatus for coating welding electrodes includes a bin to hold electrodes, a moulding press for applying coating to the bare wire and a feeding device. Friction rollers in the feeder carry the electrodes from the bin to the moulding press at a constant speed which is predetermined. A second pair of friction rollers move the electrodes through the press at a different speed, less than the first. A friction clutch on the driving means to the first pair of rollers keeps the electrode being fed moving faster than one going through the press.



WELD PIPE
Faster . . . Easier . . . Truer
WITH
JEWEL PIPE CLAMPS

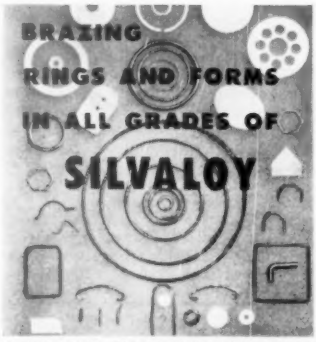
They align pipe perfectly and hold it secure for tacking. On in a minute—off in ten seconds. Two sizes, ½ to 8 in.—8 to 16 in. Rigid construction resists strain, heat, and abuse.

Other Jewel Clamps for Ells, long and short turn—for Flanges—for Headers. Also Pipe Marker, eliminates patterns for holes and saddles.

So simple—so easy to use—Jewel Tools are proving big time-savers in refinery piping fabrication and erection.

Write Today for Details and Prices

JEWEL Manufacturing Company
1841 University Ave.
ST. PAUL 4, MINNESOTA



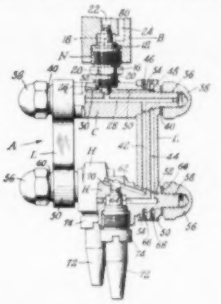
ADVANTAGES OF PREPLACED SILVALOY FORMS—

- Eliminates hand feeding . . . insures faster production
- Accurate control of amount of alloy used
- Strong, leak-tight uniform joints
- Used with either torch, gas air burners, furnace, induction and other electrical methods

DISTRIBUTED BY
STEEL SALES CORPORATION
Chicago, Illinois — Tichnor 7-7700
Detroit, Michigan — Tyler 6-3000
St. Louis, Mo. — Grand 5355
Milwaukee, Wis. — Daly 8-6860
Indianapolis, Ind. — Talbot 1506
Minneapolis, Minn. — Geneva 2500
Kansas City, Mo. — Jefferson 1080
Grand Rapids, Mich. — 9-3981

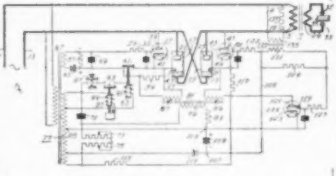
Double Torch Attachment

2,492,526. FRANK C. GEIBIG, Westfield, N. J. Assigned to The Linde Air Products Co., New York City. Filed March 14, 1945. Granted Dec. 27, 1949.



A multinozzle torch constructed and arranged to simultaneously cut two kerfs in a metal member has a single torch nipple attachable to a torch body with passages for heating gas and cutting oxygen. A cross block is connected at its center to the nipple and has longitudinal passages communicating with the nipple passages. Adjustable clamping means engage two nozzle blocks in selected positions. Cutting oxygen nozzles are connected to the nozzle blocks. Passages are arranged in this linkage to deliver heating gas and cutting oxygen from the cross block to the nozzle blocks and nozzles.

* * *



R-W Control Circuit

2,501,358. CLARENCE B. STADUM, Edgewood, Pa. Assigned to Westinghouse Electric Corp., East Pittsburgh, Pa. Filed June 25, 1945. Granted March 21, 1950.

Patent pertains to an electronic control circuit for resistance welders.

* * *

Electrode for Cast Iron

2,499,827. THEODORE EPHRAIM KIHLGREN, Scotch Plains, N. J. Assigned to The International Nickel Co., Inc., New York City. Filed Feb. 28, 1947. Granted March 7, 1950.

Newly issued patent covers an arc welding electrode designed to produce crack-free welds in high phosphorus cast iron. The core wire contains from 40 to 75% nickel with the balance mainly iron. A flux coating about the core contains 10 to 30 parts carbon, 0.25 to 2.5 parts titanium alloy, iron powder ranging up to 30 parts and from 45 to 85 parts of slag-forming materials, including a binder.

LOW JOB COSTS—SURER PROFITS WITH LOW-TEMPERATURE ALLOYS

"Everything to weld anything"
ALL-STATE
ALLOYS AND FLUXES

price complete $15
ALL-PURPOSE . . . LOW COST . . . SAVES TIME . . . EASY TO USE

This Kit Will Bring You All The Savings of Low Temperature.

- **SAVE** Dismantling.
- **SAVE** Reassembly.
- **SAVE** Time.
- **SAVE** Gases.

It provides a generous plenty of alloys and fluxes for a wide range of maintenance and salvage jobs. Enough to save many times its cost. Fine for experimental production with idea of purchasing rod selected in bulk from All-State Distributor.

It contains ample silver solder, and ten other kinds of alloys for cost-saving, low-temperature work. And it contains galvanizing powder, and the wide selection of 8 fluxes to assure the very best low-temperature welding and brazing work at low job cost. Comes in a sturdy metal box with leatherette rod roll.

NEW! FLUX COATED!
Introductory quantities of two flux coated rods are now included in the Doc Alloys Kit. Types are: All-State No. 11 Flux Coated Nickel Silver; All-State No. 13 Flux Coated Build Up Nickel Silver.

Ask your ALL-STATE Distributor for ALL-STATE DOC ALLOYS KIT.

Send for new 32-page handbook on Low-Temperature Welding

ALL-STATE
WELDING ALLOYS CO., INC.
273 Ferris Avenue
White Plains, N. Y.

WELDING ENGINEERS, DESIGNERS, SUPERVISORS!

HERE'S A BOOK TO HELP YOU...

"WELDING DESIGN HANDBOOK"

7 chapters containing complete data for those engaged in welding design. In addition to consideration of basic design problems, there is included a number of single pages of data. These are grouped to give pertinent data on welding processes, weld joints and stresses, welded design, cost, materials, pipe data and engineering tables.

• •

$1.50 per copy

• • •

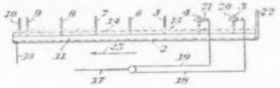
Order Today, from

THE WELDING ENGINEER

330 W. 42nd St. **New York 18, New York**

Arc Welding Method

2,494,718. Robert P. Palmer, Steubenville, O. Filed June 15, 1948. Granted Jan. 17, 1950.

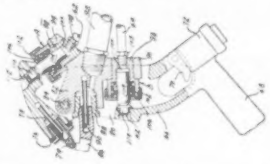


Patent pertains to a method of welding a workpiece by laying an electrode along the contemplated weld line and striking an arc between it and the workpiece at a number of points. The workpiece is insulated from the electrode between the spaced points at which current is applied. Current is applied only to the portion of the electrode which lies adjacent the arc and as the arc progresses to each point the current is stopped at that point. Current is reapplied to another point on the electrode adjacent to but in advance of the arc. Thus current is supplied to the electrode uninterruptedly during welding and only to that portion of the weld immediately adjacent to the arc.

* * *

Welding Gun

2,496,104. Elmer F. Paner, Detroit. Filed July 11, 1946. Granted Jan. 31, 1950.

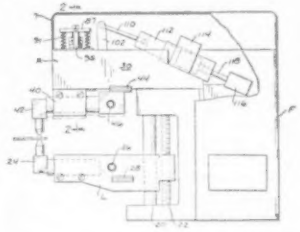


Patent pertains to a resistance welding gun which has a body portion and a normally fixed electrode. Another electrode is carried by a pivoted carrier on the gun body. The carrier also has two cylinders, one on each side of the pivot. Pistons in the cylinders have one end in contact with the body and fluid passages connecting to the cylinders for alternately conducting pressure to each of them.

* * *

R-W Electrode Mount

2,492,551. Paul E. Brunberg, Detroit. Filed Aug. 31, 1948. Granted Dec. 27, 1949.



Newly patented mount for a spot welding electrode comprises a relatively frictionless guide to permit a straight-line movement of the electrode. A spring exerts force on the electrode by means of a toggle. A solenoid moves the toggles to overcenter position and another moves them away from overcenter.

METAL BOND
METAL BOND MFG. CO.

SOLDERING
and
WELDING
PRODUCTS
—the choice of successful welders

SEAL-X-O

A preparation used for sealing air holes on electric welds on water jackets, etc. Can be used as a filler over rough welds. Where no tensile strength is needed it has many uses. This and all METAL BOND products can help you make more money on every welding job.

• Send for our pocket-size catalog. Contains information on welding, brazing, and soldering with descriptions of money-saving METAL BOND Products.

METAL BOND MFG. CO.
3201 KOSSUTH AVE.
ST. LOUIS 7, MISSOURI

DID YOU FORGET TO TELL US ABOUT YOUR CHANGE OF ADDRESS?

Don't risk missing a single issue of your WELDING ENGINEER subscription! If you are going to change your address, be sure to notify your local postmaster and let us know at least a month in advance. Use handy coupon below! Thanks for cooperating!

The WELDING ENGINEER
Circulation Department
330 West 42nd Street New York 18, N. Y.

MY NEW ADDRESS WILL BE:

Street .....
City .....Postal Zone No.....
State .....
Signed .....
OLD ADDRESS .....
.....

Be sure to include street address, City, Postal Zone Number and State in above.

NWSA REPORT

(Continued from page 29)

useful purposes they serve. Every six months, summaries on the purchases of each customer are tabulated and compared with the same six months of the preceding year. Salesmen find these figures very useful.

H. W. Cessna, Cessna Welding Supply Co., Baton Rouge, La., made his scheduled talk on "the type of display or showroom which appears most effective" short almost to the vanishing point. In lieu of verbal explanation, Mr. Cessna passed around a folder of photographs of his attractive store and showroom.

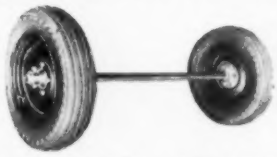
The talk which aroused the greatest interest (as measured by the number of those who wanted to get into the discussion) was that by W. O. Schneiderwind, president, Omaha Welding Co., on how to conduct a welding clinic or "confab," as they call it in Omaha. He outlined nine essential steps: (1) Make the general plan; (2) decide on the date and place—both very important to the success of the confab; (3) invite manufacturers to participate; (4) prepare a floor plan; (5) get out your advertising; (6) organize your personnel and instruct each man in his duties; (8) plan the detail handling; (9) the actual confab.

It doesn't cost too much to hold a confab, said Schneiderwind, head of a firm that has been holding them for 14 years. Probably not more than $500 is needed to do the job at Omaha Welding.

President-elect Glenn Garman delivered his report as chairman of the resolutions committee at the close of the session. Resolutions were adopted thanking retiring president Mars for his past year's administration, thanking each of the speakers who appeared on the Monday and Tuesday morning programs and thanking manufacturers who have mentioned and are mentioning distributors in their trade paper advertising. Other resolutions expressed the sorrow of the organization over the deaths of two members during the year: Robert S. McCracken, of R. S. McCracken & Sons, Inc., Philadelphia, and V. S. Rice, of Virginia Welding Co., Charleston, West Va.

Next year's convention will be held in Cleveland, at a time to be fixed later.

Axle and Wheel Assemblies
At New Low Prices!



Tested 4,000 lbs. Your Cost Only.. **$19.95**
Quantity Discounts Available
Less Tires & Tubes F.O.B. Factory

BUILD TRAILERS FOR
• Stock • Feed • Horses
• Boats • Fence • General Utility
• Sprays • Industry • Under Elevators

• Timken Tapered Roller Bearings, Heavy Duty Hubs.
• 15" or 16" Demountable Wheels.
• 59" Tread (other widths available).
• Solid Steel 1½" Square Axles.
• All New Material.
• Immediate Delivery.

ORDER NOW!
STUB AXLES—$18.00 SET
Farm Wagons—Light and Heavy
Write for Free Literature
STANDARD EQUIPMENT CO.
Dept. WE Cedar Rapids, Iowa

W-AL-CO RODS
for Welding of ALUMINUM
ELECTRIC AND GAS WELDING
Drawn Wire
TYPES 2S, 43 and 52
Brazing 716

FOR CAST ALUMINUM
Use Extruded Rods
Types 142, 195, 355 and 356
for Better Welding
3/16" size only

Aluminum Solder
White Metal

Welding Alloys Manufacturing Co.
744 Broad St., Newark 2, N. J.

are businessmen

COLD-BLOODED?

OF COURSE NOT! Literally, their normal body temperature is 98.6—same as laborers, engineers or any other group of people. And, figuratively, they're no more, or no less, cold-blooded—as a group.

We all know unreasonable generalizations can be dangerously false. Common sense and on-the-job experience show us the value of dealing specifically with ideas, problems—and *people*.

Let's not make the big—and costly—mistake, then, of generalizing on religious or racial groups. Adopt and *carry out* these common sense principles:

1. Accept—or reject—people on *their individual worth.*
2. Don't listen to or spread rumors against a race or a religion.
3. Speak up, wherever we are, *against* prejudice. Work for understanding.

A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

Published in the public interest by:

McGraw-Hill Publications

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: "OPPORTUNITIES" :EQUIPMENT
BUSINESS: :USED OR RESALE

RATES

UNDISPLAYED

(*Not available for equipment advertising*)
90c a line, minimum 4 lines. To figure advance payment count 5 average words as a line.
Individual Employment Wanted advertising rate is ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED

Individual Spaces with border rules for prominent display of advertisements.
The advertising rate is $8.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.
New advertisements received by June 15th will appear in the July issue.

STAINLESS STEEL ELECTRODES

at greatly reduced prices.

7,500 lbs.	3/32"	Page	18-8
17,000 "	1/8"	Arcos	25-20
50,000 "	5/32"	Murex	25-20
20,000 "	5/32"	Arcos	19-9
10,000 "	5/32"	Page	18-8
4,000 "	3/16"	P.&H.	19-9
30,000 "	3/16"	McKay	19-9
10,000 "	3/16"	Cu Zu Bronze	

All Electrodes packed for export. Write for prices.

INDUSTRIAL AIR PRODUCTS CO.
3200 N.W. Yeon Avenue Portland 10, Oregon

LATE TYPE WELDERS

150 KVA Federal Seam Welder.
100 KVA Taylor-Winfield Seam Welder.
Type PMC02S4 & S5 Sciaky Stored Energy Spot Welders.
50 KVA Federal Spot Welder.
28 KVA Taylor-Winfield Spot Welder.
(5) 600 Amp. General Electric Arc Welders.

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1974 S. Meridian St.
INDIANAPOLIS, INDIANA

FOR SALE

Electric Welding Machines, direct current, 400 amp. Capacity, motor generator type, for 3 phase, 60 cycle, 220 volts.

All Makes and Priced Low

ALABAMA DRY DOCK & SHIPBUILDING CO.
P.O. BOX 190
MOBILE 2, ALABAMA

IN 100-LB. LOTS, F.O.B. SCRANTON
SALE OF SURPLUS ELECTRODES

Ampco-Trode, 3/16—#10 Alum. Bronze	45c-lb.
Eccleg & Davies, 3/16—Phosphor Bronze	30c-lb.
Murex, 3/16—25/20 Stainless AC-DC	50c-lb.
Murex, 5/32—18/8 Mo. Stainless	50c-lb.
Reid-Avery, 5/32—19/9 Stainless	40c-lb.
Reid-Avery, 5/16—25/20 Stainless	25c-lb.
Arcos, 1/8-5/32-3/16 Chromang 19/9 MN Type 307 Stainless	35c-lb.
Alloy Rods Co., 3/16—Armorare— 19/9 MN Type 307 Stainless	35c-lb.

Scranton Welding Supply Company
1301 Wyoming Avenue Scranton, Penna.

STAINLESS AND HARD-SURFACING ELECTRODES

Guaranteed Performance at Greatly Reduced Prices STOODITE and STOODEX 3/16" (Bare). For oxy-acetylene applic'n of HARD-FACING to plows, implements, etc. STAINLESS: Crucible Rezistal, McKay, Page, Arcos, Armorac. Types 307, 308, 310, 347. 3/32" to ¼".

LESCO PRODUCTS CO.
3010 S. Annabelle Detroit 25, Mich.

FOR SALE

Complete G.E. Automatic Atomic-Hydrogen Arc Welding machine with all controls, mounted on portable base with many features for production welding including air operated head for raising and lowering. Can be seen in operation. No set-up involved, just plug in and operate. Costs over $6,000.00, selling for $3,000.00. Guaranteed like new.

FS 6635, Welding Engineer,
520 N. Michigan Ave., Chicago 11, Ill.

STAINLESS ELECTRODES

5/32" Page 18-8 Type 307	25c Lb.
3/16" Raco 18-8 Type 307	22c Lb.
1/4" Raco 25-20 Type 310	30c Lb.
Above pkgd. for exp. Rod and boxes look new.	
1/4" Page 18-8 Type 307	23c Lb.

J. A. Cunningham Equipment, Inc.
2025 Trenton Avenue — Philadelphia 25

FOR SALE: OXWELD NOZZLES, complete with tips, No. W-17 and W-22, sizes #4 and #6. Brand new, in original boxes, $1.75 ea., 150 of each in stock.

STRATFORD METAL AND RUBBER CO.
1558 Barnum Ave., Bridgeport, Conn.

SAVE on REBUILT and UNCONDITIONALLY GUARANTEED

ARC & SPOT WELDERS

Send for our bargain pricelist.
WE BUY AND SELL
Send us your list of surplus equipment.

MONTGOMERY ENGINEERING CO.
14173 Prairie Detroit 4, Mich.

WELDING MACHINES AT BARGAIN PRICES

Used & Guaranteed West.—AC Transformer Type, WT4 200 AMP., Portable, 220 Volts—$95.00. WT2, 300 AMP., Portable, 220 Volts—$155.00. Also New G.E. 150 AMP. Atomic Hydrogen Arc Welder with Transformer and Auto. Head—$650.00.

B. D. BROOKS CO., INC.
Specialists in Sheet Metal Machinery
361 Atlantic Avenue Boston 10, Mass.

OXWELD CM-15a, Nat. Sz. Harris K's, Gase S-24, AIRCO Travagraph, Oxy-grash and Camegraphs. SEAM WELDER, Progressive 150KVA, new. SPOT WELDER, National, 40KVA for Brass and Stainless. BRONZE, STAINLESS, AMPCOTRODES. NO. 12 LENSES, ELECTRODE HOLDERS.

RALL SUPPLY COMPANY
118 E. 42nd St., NYC 17

WHERE TO BUY

6714 Bryn Mawr Ave.

SEARCHLIGHT SECTION

Nationally known manufacturer of a complete line of electric welders desires manufacturers representatives, specializing in welding equipment, to cover western states, Colorado and west. Protected territories. Numerous distributors now handling the line will be assigned to representatives selected. Reply in detail giving lines now handled and territories covered.

Reply to RW 6530
The Welding Engineer
520 N. Michigan Ave., Chicago 11, Ill.

REPLIES: Box No.; Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

WE ARE interested in securing the services of an experienced repair man familiar with all types of oxygen-acetylene welding equipment; also some knowledge of welding machine repairs; duties will require some counter work. Address your reply to Dye Oxygen Company, P. O. Box 2344, Phoenix, Arizona.

POSITIONS WANTED

POSITION WANTED. Oxygen and Acetylene plant man. Experienced in installation, layout and operation. Over 20 years experience. Go anywhere. Best of references. PW 2437, Welding Engineer.

AVAILABLE HI-CALIBER Welding and sales engineer with a proven sales record with distributors and industrial sales. An expert demonstrator on both electric and acetylene equipment. Oxygen and acetylene sales. Have been employed by two major concerns. Also very familiar with construction sales and piping fabrication. Living at present in Chicago area but will leave for the right opportunity. PW 6675, Welding Engineer.

SELLING OPPORTUNITY WANTED

POSITION WANTED—Hi-caliber salesman and demonstrator of both electric and acetylene equipment and supplies, welding machines, welding rods and welding alloys. A practical man with a proven sales record. Experience with industrial sales, jobbers and distributor setups. Also oxygen and acetylene sales. SA 2162, Welding Engineer.

BUSINESS OPPORTUNITY

Exclusive Franchise, highly profitable business. Patented machine washes Venetian Blinds. Tremendous demand. Visit one of 50 successful plants. Free Booklet. $6350.00, 24 payments. C. A. Equipment Co., 101 S. 44th St., Philadelphia 4, Pa.

Exclusive License available to manufacture superior line of Alternating Current Arc Welding Equipment—Automatic Voltage and Current Regulators, under OWEN Patents.

FREDERICK C. OWEN
426 Pearl St. Fayetteville, North Carolina

Advertisers In This Issue

This advertisers' index is included as a convenience and is in no way part of the advertising contract. Although every care has been taken to index accurately, some errors may have occurred and no allowance will be made for them.

A

Air Reduction Sales Co..... 64
Allen Co., L. B..... 83
Alloy Rods Co..... 59
All-State Welding Alloys Co., Inc. 79
American Brass Co., The..... 65
American Chain & Cable Co., Inc. 67
American Elin Corp..... 9
American Optical Co..... 12
American Platinum Works, The.. 16
Ampco Metal, Inc.....60-61
Anti-Borax Compound Co..... 77
Arcos Corp. 62
Atlas Welding Accessories Co.... 4

B

Banner Mfg. Co..... 75
Bastian-Blessing Co., The..... 70
Becker Bros. Carbon Co..... 73
Bethlehem Steel Co..... 8
Bonney Forge & Tool Works..... 55
Bunell Machine & Tool Co..... 5

C

Contour Marker Corp..... 72
Cyc-Arc., Ltd. 68

D

Detroit Stamping Co..... 74

E

Eutectic Welding Alloys Co..... 56

G

General Electric Co.....6-7

H

Harnischfeger Corp. 47
Harris Calorific Co., The..... 48
Haynes Stellite Co., Division of Union Carbide & Carbon Corp.. 57
Hobart Bros. Co..... 1

I

Independent Eng. Co., Inc..... 78
Industrial Air Products..... 77
International Nickel Co., Inc..... 71

J

Jackson Products..Inside Front Cover
Jewel Mfg. Co..... 79

L

Lapeer Manufacturing Co..... 72
Lincoln Electric Co..... 14
Linde Air Products Co., The, Unit of Union Carbide & Carbon Corp. 69

M

Mallory & Co., Inc., P. R..... 2
Metal Bond Mfg. Co..... 81
Metal & Thermit Corp..... 39
Minnesota Mining & Mfg. Co..... 10
Modern Eng. Co., Inc..... 75

N

National Carbide Corp..... 73
National Cylinder Gas Co..... 13

O

Oakite Products, Inc..... 78

P

Page Steel & Wire Division..... 67

R

Remont Mfg. Co..... 78
Revere Copper & Brass Co..... 63
Ruemelin Mfg. Co..... 76
Shawinigan Products Corp..... 77
Square-D Company 53
Standard Equipment Co..... 81
Steel Sales Corp..... 79
Stoody Co. 11

T

Tube Turns, Inc.....Back Cover
Tweco Products Co.....
.....Inside Back Cover

U

Union Carbide & Carbon Corp., Haynes Stellite Division..... 57
Union Carbide & Carbon Corp., The Linde Air Products Co. Unit 69
United States Steel Corp..... 76
United States Steel Supply..... 76

V

Vacu-Blast Co., Inc..... 66
Victor Equipment Co..... 50

W

Wall Colmonoy Corp..... 41
Welding Alloys Mfg. Co..... 81

Y

York Engineering Co..... 71

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT

Positions Vacant 83
Selling Opportunities Offered.. 83
Positions Wanted 83
Selling Opportunities Wanted.. 83

BUSINESS OPPORTUNITIES

Offered 83

EQUIPMENT

(Used or Surplus New)
For Sale 83

STOP WELDING LOSSES *with* TWECO CABLE Connections

A single electrode holder thrown away is no great loss in itself, but when production and man-hours as well as a great many unnecessary replacements are involved, profits take a licking every time. Switch to TWECOTONG, the electrode holder with super-service insulation that is replaceable at small cost without discarding the entire holder.

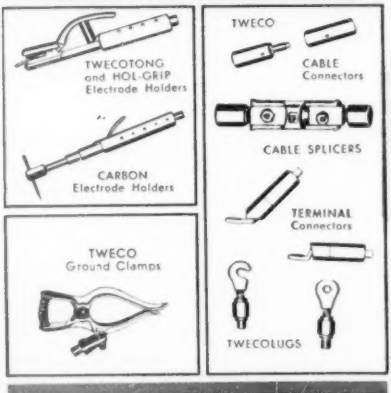
TWECOTONG TIP INSULATION

Defies Heat and Impact

TWECOTONG "Super-Mel" tip insulators are made from multi-layer glass cloth in patented tubular-keyed design. This assures a tight fit on TWECOTONG'S rugged copper alloy jaws to withstand great impact. Their melamine resin binder and exclusive TWECO construction resist heat, shock, and arc-burn more effectively than other holder insulations on the market. TWECOTONG is turning in a superior performance on all classes of work. It is especially recommended for high heat and severe service conditions.

The same TWECOTONG tip insulator fits both the top and bottom jaws on all models except A-532. A minimum TWECOTONG holder stock and a modest investment in long lasting tip insulators is all you need to maintain top holder efficiency in your shop. Buy TWECOTONG!

FROM THE WELDING MACHINE TO THE ELECTRODE AT MAXIMUM EFFICIENCY



WELD WITH TWECO

TWECOTONG SINGLE UNIT PRICE — WRITE FOR QUANTITY PRICES THEY SAVE YOU 10 TO 27%

Model A-38	Model A-14	Model A-316	Model A-532
500 AMPS for 3/8-3/32" rod	300 AMPS for 1/4-1/16" rod	250 AMPS for 3/16-1/16" rod	200 AMPS for 5/32-1/16" rod
$6.50	$5.00	$4.75	$4.50

All TWECOTONG models are standard equipped with heavy duty "Super-Mel" tip insulation.

Write for Twecolog #7 giving data and prices on the complete TWECO line of electrode holders, ground clamps and cable connections for electric welding.

Tweco PRODUCTS COMPANY

MANUFACTURERS OF ELECTRODE HOLDERS • GROUND CLAMPS • CABLE CONNECTIONS FOR ELECTRIC WELDING

ENGLISH AT IDA • WICHITA 1, KANSAS

SEE YOUR WELDING SUPPLY DISTRIBUTOR

In all the world there's only one TUBE-TURN *Welding Fitting as shown by this trade mark... the right mark for every need in welding fittings and flanges.*

TUBE-TURN

TRADE MARK

Your nearby TUBE TURNS *distributor can serve you right from stock. Call him for prompt delivery.*

TUBE TURNS, INC., LOUISVILLE 1, KENTUCKY DISTRIBUTORS IN ALL PRINCIPAL CITIES

DISTRICT OFFICES: NEW YORK • PHILADELPHIA • PITTSBURGH • CHICAGO • HOUSTON • TULSA • SAN FRANCISCO • LOS ANGELES

In Canada . . . Tube Turns of Canada Limited, Chatham, Ontario